clean air

and environmental protection

January / February 1999

the bi-monthly journal of the National Society for Clean Air and Environmental Protection vol.29 no.1

- Environmental Considerations in Urban Regeneration
- Non-Continuous Gravimetric Sampling
- NSCA Policy Committee Priorities

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The National Society for Clean Air and Environmental Protection produces information, organises conferences and training events, and campaigns on air pollution, noise and environmental protection issues. Founded in 1899, the Society's work on smoke control led to the Clean Air Acts. More recently NSCA has been influential in developing thinking on integrated pollution control, noise legislation, and air quality management.

NSCA's membership is largely made up of organisations with a direct involvement in environmental protection: industry, local authorities, universities and colleges, professional institutions, environmental consultancies and regulatory agencies. Individual membership is also available to environmental specialists within industry, local authorities, central government, technical, academic and institutional bodies.

Members benefit from joining a unique network of individuals who share an interest in a realistic approach to environmental protection policy; from access to up-to-date and relevant information; from reduced fees at NSCA conferences and training events. They contribute to NSCA's regional and national activities; to environmental policy development; to translating policy into practice; to the Society's wide-ranging educational programmes.

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nsca news

CENTENARY
1998-1999
CELEBRATIONS

News and views of the National Society for Clean Air and Environmental Protection February 1999

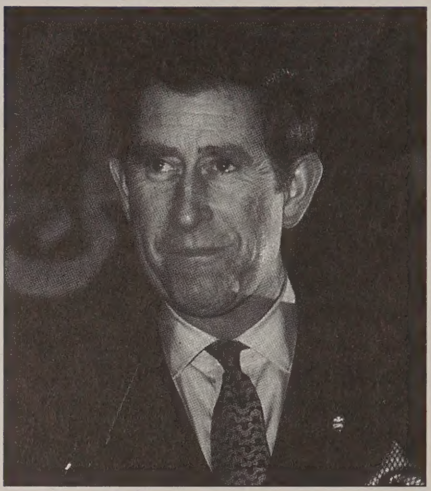
Royal Congratulations for NSCA's Centenary

Over three hundred members and friends of NSCA gathered at the Banqueting House in Whitehall for a reception to mark the Society's Centenary on 10 December. HRH The Prince of Wales attended the event and was introduced to many members by NSCA President Sir Crispin Tickell. Prince Charles spoke warmly of the NSCA's "trailblazing" role in the environmental movement:

"I really am delighted to be able to join you here this evening for a very special occasion in the life of the Society, and I do think that it is a sign of the maturity of the environmental movement that there are now significant anniversaries to celebrate.

I have recently played some part in the anniversary of the International Institute for Environmental Development, which Sir Crispin knows only too well, the 50th anniversary of the Soil Association, and the 70th anniversary of the Council for the Protection of Rural England. But tonight we are here to celebrate the Centenary of a very special organisation indeed - dare I say it, almost the father or mother of all those great names I have mentioned. And it is quite a claim to be, what is widely believed to be, the oldest national environmental body working for the control of pollution in the World. So I do congratulate the Society on this occasion.

The National Society for Clean Air is an example to us all, and it has achieved remarkable successes by bringing people together from different walks of life, by making practical use of innovative techniques, and by working with real determination over very long periods. Now I particularly admire the Society's ability to look to the future and think in the long term. The problem of smoke in Victorian cities must have seemed as intractable a problem as traffic congestion in our own. But the lesson of your first 100 years is surely that these things can be tackled if we go about them in the right way, and with sufficient determination and stamina.



I am even old enough to remember London smogs when I was a child, and also I remember every evening having filthy dirty collars to my shirt and filthy dirty cuffs. So now to find that isn't the case is really quite remarkable, but my children have no idea what they're missing!

...continued on centre pages

Minister responds to NSCA policy agenda

Michael Meacher has written to NSCA Council Chairman Lis Solkhon in response to a number of policy concerns raised by the Society. The Environment Minister confirms the Government's intention to legislate for a new duty for local authorities to promote the economic, social and environmental wellbeing of their areas.

NSCA now intends to campaign for a "sustainability clause" to be added to the current Local Government Bill, to introduce this duty (see back page).

Welcoming the Society's contribution to the debate on environmental policy, Mr Meacher outlines new developments on air quality, including proposals for objectives for the protection of vegetation and ecosystems, and possibly for $PM_{2.5}$ and PAHs. He also encourages NSCA to continue developing its own proposals for a national noise strategy.

More information from Tim Williamson at NSCA
Email: twilliamson@nsca.org.uk

At a glance...

CENTENARY

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POLICY

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Consumers and the environment: *back page*
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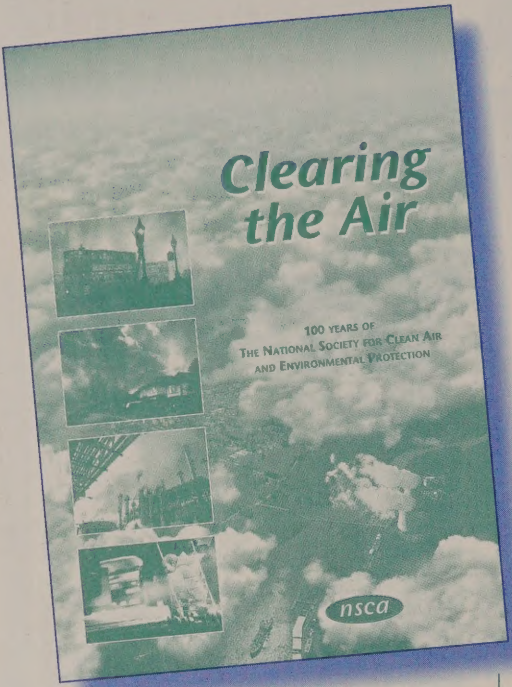
Centenary book and posters: *centre pages*

NSCA WEBSITE

The NSCA website provides instant access to all information material, the texts of factsheets and leaflets. Publications, future events, recent press releases and policy information are also being put online.

Please visit the site at http://www3.mistral.co.uk/cleanair


Clearing the Air
100 years of
The National Society for Clean Air
and Environmental Protection
nsca

A historical perspective of NSCA and air pollution control, entitled Clearing the Air, was published for the Centenary. Copies cost £10 and are available free of charge to NSCA members.

Royal Congratulations

...continued from front page

So your sustained record of achievement puts you in a strong position, I think, to look at the international aspects of sustainable development. And I hope that your conference earlier today will have produced some interesting ideas. It is obviously a serious concern that the developing world will make some of the same mistakes that the developed world made only a few generations ago. When I hear, for instance, that bicycles are being cleared from some of the streets in China to make more room for cars, my heart sinks. But if anyone can help to address these crucial issues of urbanisation and pollution in the many different parts of the World, let alone this one, I know you can.

Ladies and gentlemen, this Society can fairly claim to be the trailblazer for all environmental non-governmental organisations. Where you have led, so many others have followed. If I may say so, I think you deserve a wonderful celebration, and I wish you a very happy One Hundredth Birthday, and every possible success for the next 100 years. Many congratulations".

NSCA Centenar

**Photographs of the Prince of Wales m
Earlier in the day, many members att
Royal Society of Arts, entitled Prospect
Environment Minster Michael Meacher,
for Sustainable Development, DETR C
Beltran of the European Environmen
Botanic Gardens, and Helena Norbu
Ecology and Culture. A special Centena
Environmental Protection will fe**

The Prince of Wales cuts the NSCA Centenary Birthday cake

Gillia

Kevin Thomas (r) of the NSCA Scottish Division celebrated his own half-centenary at the reception.

SA/EPU/H/1/4/4

Reception

ng some of the guests at the Reception. d a Centenary Conference, held at the r a Sustainable World. Speakers included rn Stigson of the World Business Council Scientist David Fisk, Domingo Jimenez- ency, Sir Ghillean Prance of the Royal odge of the International Society for dition of the NSCA journal Clean Air and highlights of these presentations.

NSCA Chairman of Council Alderman Lis Solkhon greets The Prince of Wales

r Sir Crispin Tickell, John Speirs (NSCA Vice-President), Michael Meacher MP (Minister for the Environment), epard MP (Shadow Secretary of State for Environment)

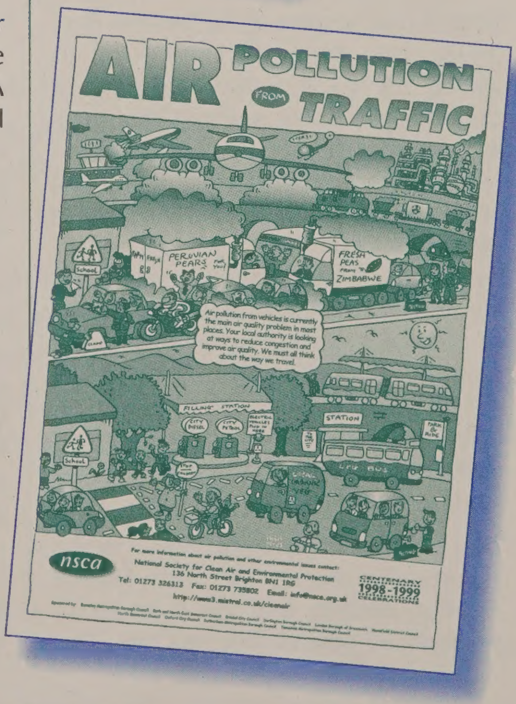
l-r Mike Frend (UK Petroleum Industry Association), Paddy Kilmartin (LPG Association), Mike Schwarz (Ford Motor Company).

NSCA Divisional representatives Dr Mary Newlands (East Midlands) and Linda Davies (South East).

One of a set of four full-colour information posters launched at the Centenary conference. Ten NSCA member local authorities sponsored the poster sets:

Oxford City Council
Bristol City Council
North Somerset Council
Bath and North East Somerset Council
Darlington Borough Council
Tameside Metropolitan Borough Council
Mansfield District Council
Rotherham Metropolitan Borough Council
London Borough of Greenwich
Barnsley Metropolitan Borough Council

The A2 format posters are available from NSCA at £20 + VAT per set; £100 + VAT for 10 sets. A leaflet, based on the posters is also available free of charge on request.



Air pollution from vehicles is currently the main air quality problem in most places. Your local authority is looking at ways to reduce congestion and improve air quality. We must all think about the way we travel.

For more information about air pollution and other environmental issues contact:
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http://www3.mistral.co.uk/cleanair

RECENT DEVELOPMENTS

Air Quality Strategy Review

NSCA has welcomed the Government's Review of the National Air Quality Strategy, which tightens some deadlines for achieving national air quality objectives, but expressed concern about the relaxation of objectives for particle pollution. "We are delighted that the Government has tightened, where it can, the national air quality objectives" said Richard Mills, NSCA Secretary General. "However we are concerned at the frank acknowledgement that the current health-based standards for particle pollution are unlikely to be reached by the year 2005. Particles cause an estimated 8,000 early deaths each year, and the Government must redouble its efforts to tackle pollution at source".

The Society called on Ministers to take further measures to tackle traffic pollution, by extending local authority powers for congestion charging and parking taxation, planned for the Greater London Authority Bill, to the rest of the UK; and by introducing further fiscal measures to encourage cleaner fuels and less polluting modes of transport.

Parliamentary Issues

With a new session of Parliament now under way, NSCA is campaigning to amend the Local Government Bill in order to give local authorities a duty to promote the social, economic and environmental wellbeing of their areas. NSCA Council concluded that this was an essential step in promoting sustainable development at local level. The Council endorsed the view of NSCA's Local Environmental Management Forum that sustainability should be regarded as an essential aspect of the Bill's objectives of economy, efficiency and effectiveness for local authorities.

The issue has already been raised successfully during the Bill's Second Reading debate, and NSCA hopes to promote an amendment at Committee Stage. Meanwhile the Society has appointed Jessie Robertson as its Parliamentary Liaison Officer to help monitor business in parliament and identify opportunities to bring its concerns to parliamentary notice.

Details from Tim Williamson at NSCA
Email: twilliamson@nsca.org.uk

NSCA Spring Workshop

Local authorities have largely completed their first stage of air quality review and assessment, and now face a number of new challenges. The NSCA Spring Workshop will provide an overview of developments in air quality management, including the implications of the Government's Review of the National Air Quality Strategy for undertaking second and third stage review and assessments. The annual Workshop, which has established a reputation for bringing together UK opinion formers, will be held at Milton Hill Training Centre, near Abingdon on 18 and 19 March.

Full programme on request
from NSCA.

Northern Ireland: Air Quality Management

Northern Ireland took an important step towards air quality management in January with a major conference for local authorities on air quality review and assessment, sponsored by the Northern Ireland Environment Department, NSCA and the CIEH.

Pollution levels in the Belfast area are among the most severe in the UK, and NSCA has been urging voluntary introduction of local air quality management ahead of formal enactment of legislation, to parallel that already in place elsewhere in the UK. NSCA warmly welcomed the Northern Ireland Office's initiative in promoting the conference, which took as its starting point a milestone report, Air Quality in Northern Ireland, prepared by the Northern Ireland Pollution Control Group, led by Ivan Gregg of Belfast City Council.

NSCA calls for National Noise Strategy

NSCA has written to Environment Minister Michael Meacher asking the government to prepare a national strategy for the reduction of ambient noise. An EU Directive on noise is likely to require noise mapping and management plans in major UK cities, and the Society points out that the current framework for noise control is piecemeal and poorly co-ordinated. Details from Tim Williamson at NSCA: twilliamson@nsca.org.uk

Details from Tim Williamson at NSCA
Email: twilliamson@nsca.org.uk

Cleaner Fuels

NSCA is co-operating with the LP Gas Association in a conference on environmental and operational aspects of using LPG as a motor fuel. The venue is the Royal Society of Arts in London and the date is 24 February.

Details from LPGA on 01425 461612.

Consumers and the Environment

NSCA has given oral evidence to the Environment Select Committee on reducing the environmental impact of consumer products. The Society has pointed out the potential role for local authorities in advising consumers about environmental issues, and encouraging local initiatives which promote more sustainable patterns of consumption.

Details from Tim Brown at NSCA
Email: tbrown@nsca.org.uk

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The voice of environmental protection since 1898

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Editorial

SUCCESSFUL PAST, CHALLENGING FUTURE

One of the advantages of launching a year of centenary celebrations - as NSCA just has - is that it focuses our attention on the inevitable question: where does the Society go from here? Our recently published history* *Clearing the Air* shows that we have some major achievements behind us, but there is more to do.

At the centenary conference in December we published a statement of current policy priorities*. One of the most important is to ensure that the current framework for assessing and managing air quality, which the Society worked so hard to secure, is implemented effectively. This will involve close liaison across the range of air quality management interests, something which NSCA is uniquely placed to facilitate. We must continue to speak authoritatively on air pollution issues as they affect different sectors - industry, transport, domestic - and overlap with other areas of environmental policy - land use, climate change, sustainable development, noise, and so on.

There is no doubt that the measurement, and indications of trends, in air quality will become important in tracking the progress of sustainable development in the UK. Air pollution is one of a small number of "headline" national indicators for sustainable development, whilst at local level air quality will be a central theme of Local Agenda 21 Plans with direct relevance to health, transport, biodiversity and quality of life issues. NSCA expects to deepen its involvement in the interpretation and communication of air quality data, as part of a wider remit to encourage a balanced approach to the management of the local environment. The Society's Local Environmental Management Forum is embarking on a number of specific projects to take this forward.

NSCA's long history also shows the benefits of a membership which includes industry, local authorities, regulators and researchers. Industrial pollution will remain a key issue for the Society as regulatory policies develop in the light of the EU Directive on Integrated Pollution Prevention and Control, and the adoption of environmental management systems.

Essentially, NSCA plans to build on its expertise in areas where it already has a proven track record: air quality, noise, transport, energy, industrial pollution. We must work these into a coherent approach to environmental management at local, national, and - through our worldwide contacts - international level. Linking this with a realistic framework for assessing the economic and social benefits of environmental protection is really what sustainable development is all about. This is the challenge for the future.

*Available on request from NSCA Head Office

NSCA News & Views

NSCA POLICY COMMITTEE PRIORITIES

1998-99

The NSCA's committee structure has been and still is undergoing a period of reformation and change, both in terms of the remit and operation of the existing committees and in the breadth of issues covered. This paper focuses principally on the short to medium term priorities of the three existing policy committees. It also covers other initiatives outside the main committee structure, such as the Cleaner Fuels Forum, as well as specific policy development projects already established or proposed in such areas as smoke control, industrial regulation, cleaner technology and transboundary pollution.

Air Quality Committee

Recent years have seen a massive amount of policy development and legislation in air quality areas, such that we now have a complete statutory framework for assessing and addressing air quality problems. While some gaps in the detail still remain, particularly in the provision of legislative tools to deal with air quality problems, the next few years are likely to see a period of consolidation while the system is implemented. The main elements of the Committee's work will therefore be:

- to monitor and contribute to the review of the Strategy, helping to ensure that it makes the best practical contribution to improving air quality;
- to develop and promote new policy instruments to help local authorities in particular achieve their targets under the strategy; and
- through the wide range of organisations and interests represented on the Committee, to promote a framework for developing and sharing good practice in local air quality management.

The current priority for Local Air Quality Management is the development of partnerships, both within and external to the normal local authority structures. The "good practice in consultation" guide will be central to this, and the Spring Workshop will be dealing with these general themes. In addition, the Committee will maintain a close watch on the Local Air Quality management system and be prepared to respond on an *ad hoc* basis to issues as they arise.

The consultation paper on the proposed changes to the National Air Quality Strategy is due for publication at the end of 1998. The Committee will be developing a detailed consultation response, along the same lines as its influential responses to the draft strategy and to the Pollutant Specific Guidance.

The Committee regards training and education as vital and there is a full commitment to the further development of teaching resources for schools from the base already established by the Transport Emissions Assessment for Schools (TEAS) pack. A new resource, to be produced in partnership with a firm of professional publishers of educational material, is timetabled for the Don't Choke Britain Campaign in 1999 and will form part of the Centenary Celebrations.

Implementation of the Transport White Paper will become increasingly important. The implementation of traffic planning measures will, to a large extent, determine the rate of local air quality improvements towards 2005. The Committee will therefore need to become more involved with the business of transport change both at a policy level and in the provision of advice and training on specific issues, such as school travel plans and transport demand management, particularly in the commercial sector.

National Noise Committee

It has been said that noise policy in this country is at the same position as air quality was some ten years ago. The major task, therefore, is to accelerate progress on noise issues such that it is seen on an equal footing with air quality management in the near future. This will require a shift in emphasis away from specific, local issues such as domestic noise, towards the consideration of ambient noise levels and the reduction of environmental noise.

The central plank of the Committee's work will be the campaign to develop a coherent UK Noise Strategy. The Committee aimed to produce proposals for such a strategy in some form by the end of 1998.

The development and, ultimately, the implementation of the EU Directive on Noise will also be a key priority. The Directive is likely to come into force, at least in part, in 2002 but there will be a role in gearing up UK local authorities to the implication of the Directive and in lobbying the Government on issues of concern to the Committee which arise both from negotiations on the content of the Directive and from the working groups with the Commission's DG XI. The likely content of the Directive is already apparent and there is now an opportunity to explore the options for the reduction of environmental noise prior to implementation.

Local Environmental Management Forum

Despite having been established only a relatively short time, the Forum has moved rapidly forward on the three project areas it set out earlier in the year. In addition to the continued development of these, the Forum will operate as a means of formulating policies to ensure good environmental management practice and sustainable development on a local level.

Following its detailed response to the draft UK sustainable development strategy, *Opportunities for Change*, the Forum has produced proposals to promote sustainable development at a local level. The proposals include a duty for local authorities to produce a sustainable development strategy for their area, in partnership with business, industry and the public. It broadly mirrors the proposals in the Government's White Paper on modernising local government but it remains to be seen how these proposals are to be implemented. A working group, made up of Forum members, will be looking at these specific issues and further developing the shape of the new duty proposed in the White Paper.

The setting up of the Government's Urban Task Force marked an opportunity for the Forum to put forward a new approach to local environmental management in an urban setting. It submitted detailed evidence to the Task Force setting out this new approach in September. The Forum will continue to work on the development of these ideas and on methods by which they can be implemented by local authorities.

The third project area which the Forum has undertaken is a critical review of the utility of environmental management systems to local authorities, both in terms of the advancement of local environment management and environmental policy development. The initial stage of this project, which is being undertaken in partnership with the Chartered Institute of Environmental Health, is a questionnaire survey of local authorities who are either accredited for ISO 14001 or EMAS or who are working towards accreditation. The results of the survey will form the basis for a more detailed analysis of the work of a smaller number of authorities, culminating in a seminar and report in the Spring.

The Forum continues to develop other project and discussion areas, maintaining its brief of looking at the issues which cut across the traditional boundaries of environmental, social and economic concerns.

Other Policy and Project Areas

Outside the main framework of policy committees, the Society's Council establishes from time to time special working groups or task forces to investigate and develop policy proposals on more specific issues. Those which are currently established or agreed include:

Low Emission Zones Project

This new study by the NSCA Cleaner Fuels Forum will assess the ways in which cleaner fuels and vehicle technology can be targeted locally to meet air quality and other environmental management objectives. Ministers are known to be keen on the idea of low emission zones (LEZ); the research project will explore the concept by bringing together the major interests in the area including fuel retailers, vehicle manufacturers, fleet operators, local authorities and researchers.

In September the first meeting of the project group agreed a programme of work which will be coordinated by consultants, Transport and Travel Research, and the University of the West of England Air Quality Management Resource Centre. Specific objectives of the work will be to define criteria for low emission zones, to examine the practical issues surrounding a LEZ, and to provide a 'tool-kit' for local authorities to assist them in taking the LEZ concept further. Wider traffic and environmental impacts, and the possible social and economic impacts of LEZs will also come under scrutiny.

The study has been funded by a grant from the BOC Foundation, with additional support from the DETR, Calor Autogas, the Confederation of Passenger Transport, Greenergy, Natural Gas Vehicle Association, Sainsbury's, LPG Association, London Transport Buses, Safeway Stores, Shell Autogas, SMMT, UKPIA and Vauxhall.

Transboundary Air Pollution

This group was established to formulate the Society's policy on the proposed European Acidification Strategy. It has now also produced a major overview of the environmental effects of acid deposition. It is proposed that it now widen its remit to consider certain aspects of climate change, focusing in particular on the relationship of CO_2 reduction measures to other air quality policies, and on some of the scientific interfaces between climate change and other transboundary air pollution issues.

Barriers to Cleaner Technology

The Society proposes to undertake a six-month exercise to review possible major developments in the environmental regulation of industry. It is proposed that the work focus in particular on the implications of IPPC, and, more generally, on barriers to adoption of cleaner technology. The group will be chaired by Dr David Slater, formerly Director of Policy at the Environment Agency.

Smoke Control

The Society's East Midlands and Yorkshire Divisions are collaborating in a project to review residual issues in smoke control, focusing in particular on sales of unauthorised fuels and their potential impact on the achievement of air quality targets. A survey is being undertaken to determine the extent of the problem, and the group is expected to report in the New Year.

Land and Water Contamination

Land and water issues feature periodically in the programme of the Society, but in a less systematic or complete way than as for air pollution. The Council of the Society has therefore decided to set up a small group to review and make recommendations on the extent and focus of the Society's work in these areas.

Enquires in respect of the work of any of the above Committees and Working Groups should be addressed to the NSCA's Policy Officer, Tim Williamson,
Tel: 01273 326313;
Email: twilliamson@nsca.org.uk

ACID DEPOSITION IN THE UK:

A Review of Environmental Damage and Recovery Prospects

As part of its Centenary Celebrations, NSCA is producing a series of papers which mark the "state of the art" for a number of environmental policy areas. The article which appears below is the preface to the first, Acid Deposition in the UK, which was compiled through the Jackson Environment Institute, University College London. All the papers will be widely distributed to those with a special interest in the field and will also be freely available to NSCA members, on request. For non-members there will be a charge of £25.

During the early 1980s, acid rain, and the damage caused to forests and lakes all over Europe, captured the public imagination. It was the first atmospheric pollution issue which engaged the European Union in a concerted programme of action and the then Government's refusal to accept some responsibility, for damage in Germany and Scandinavia, labelled the UK as the "dirty man of Europe". Since that time, other issues such as ozone depletion and CFCs, climate change and urban air quality have taken centre stage. However, acidification of sensitive habitats continues, particularly in the upland National Parks which together make up the majority of Britain's best loved country-side.

This report analyses the current status of acidification in Britain today, the trends in both emissions and deposition and the future prospects for damage recovery. It was commissioned by NSCA and forms its contribution to the debate on future acidification policy. In May 1998, NSCA and the Jackson Environment Institute of University College London jointly hosted a roundtable discussion of the leading experts in the field. The views expressed came from all sides of the debate, reflecting the consensus building approach of NSCA, and contributed substantially to the content of this report.

It is clear that emissions of SO_2 have been falling over recent years and are set to fall further due to the successful implementation of various EU Directives and changes in fuel use patterns. However, while deposition has also fallen, a disproportionate part of that fall has been in dry deposition, which mainly occurs in the lower level regions closer to sources. Wet deposition in upland areas such as Snowdonia, the Lake District, the Pennines and the North Yorkshire Moors, i.e. those areas which have been damaged most by acidification, has fallen less sharply.

The picture for nitrogen species is less clear, for although NOx emissions have dropped recently, there is no reliable data for reduced nitrogen (NHx). For some years, it had been thought that natural processes would effectively neutralise deposited nitrogen. However, there is now evidence that the capacity of some eco-systems to "absorb" nitrogen has become severely limited, partly offsetting the reductions in NOx emissions. There is also some irony in the fact that, due to stricter controls on large combustion plant and the use of cleaner domestic fuels, the emission of base cations (the substances which help to "buffer" acidification in the environment), in the form of fly ash, has also dropped. This means that the reduction of acid emissions has had less of an effect on acidification than had been hoped.

These issues, and the complexities of natural eco-systems, have meant that recovery, certainly in upland areas, has been extremely slow. In some of the most sensitive areas, acidification has continued and is likely to continue, albeit at a slower rate, unless further emission reductions are agreed. There are, however, marked differences between the expected recovery of damaged systems and the reality and the differences between the recovery rates of low lying and upland habitats. This emphasises the need for further research into the biological processes which both assist and hinder recovery following acidification damage.

What is clear is that continuing reductions in acid forming emissions are required if further ecological damage is to be prevented and recovery allowed to take place. There needs to be a scientific judgement as to which gases should become the focus of future emission reduction programmes. Sulphur emissions are already tightly controlled and NOx control is approaching the same level. The National Air Quality Strategy will contribute significantly to the reduction of urban NOx emissions, particularly from transport sources. This, incidentally, is an excellent example of the national or global scale benefits to be gained from action at local level. The sources and quantities of NHx emissions are only just beginning to be understood and further work is needed before their contribution to acidification can be assessed.

However, there also needs to be a social and political judgement of the value of biodiversity in our upland areas, whose contribution to Britain's natural heritage far outweighs their land value. They are among the best regarded and most sensitive habitats in the UK and the continuing threat posed by acidification shows that the pressure to reduce emissions must be maintained.

NSCA would like to record its sincere thanks to the authors of this paper and particularly to Chris Curtis of the Environmental Change Centre, UCL, John Murlis of the Jackson Environment Institute, UCL and all the staff involved in co-ordinating the work.

LOCAL ENVIRONMENTAL MANAGEMENT SYSTEMS WITHIN LOCAL AUTHORITIES

NSCA's Local Environmental Management Forum was established to encourage debate and innovation in the management of local environmental services. It aims to foster effective policies and good practice in pursuit of sustainable development at local level. One of the Forum's main areas of focus is the implementation and efficacy of environmental management within local authorities. To this end, we are examining existing environmental management systems.

The aims of this study are:

- to establish, from those with experience, the key factors which contribute to the successful implementation of local authority environmental management systems;
- to establish what tangible and perceived benefits local authority environment management systems offer local authorities;
- to identify key pitfalls and barriers to successful implementation of local authority environmental management systems;
- to compile useful and helpful guidance for authorities considering implementing an environmental management system.

As a first phase of this work, we have carried out a postal questionnaire of selected local authorities, known to be implementing environmental management. The responses are currently being analysed. The next phase will be more detailed research work, culminating in a roundtable seminar.

LOW EMISSION ZONES

The NSCA Cleaner Fuels Forum has now entered a new phase of work, centred on a Low Emission Zones Project. The second meeting of project partners, hosted by Westminster City Council in November, discussed draft criteria for establishing LEZs. The project will be reporting to the Government's Cleaner Vehicles Task Force, which has identified LEZs as a priority for action. New Government guidance also mentions LEZs as a possible component of Local Transport Plans. More information on the project from Tim Brown at NSCA: tbrown@nsca.org.uk

NATIONAL NOISE AWARENESS DAY 1999

For the past three years NSCA has co-ordinated a National Noise Awareness Day on behalf of the DETR. The need for this was identified out of concern for increases in complaints about noise nuisance to local authorities over preceding years. Noise is an emotive issue and neighbour noise cases receive wide and often sensational coverage in the media. The objective of NAD has been to increase public awareness and understanding of noise issues, and to encourage local authority noise control officers to undertake local awareness raising initiatives. In past years over 200 local authorities have co-ordinated activities, and NAD has received wide coverage in national and local media. Action promoting understanding of the noise climate is an important element in sustainable development education. Noise can impact on both physical and mental health and in particular there is increasing concern about the damage amplified music can cause to hearing.

Noise pollution is now moving up the political agenda both in Europe and in the UK. Proposed EU obligations for noise mapping by local authorities will place noise at the centre of sustainability issues. With many sustainable development plans seeking to mix residential and commercial premises, transport and commercial noise will need to be taken into account in the planning process.

It is proposed therefore that more resources are put into NAD for 1999. Planning is well under way, and other organisations with an interest in noise and its effects have been approached with a view to working in partnership with NSCA and DETR. If you are interested in participating, or have any ideas for activities or themes for NAD 1999, contact Mary Stevens: info@nsca.org.uk

AVIATION NOISE

An Aviation Transport Action Roundtable has recently been formed to consider ways of minimising the environmental impacts of air transport. Leading the Roundtable are the Airports Policy Consortium, Aviation Environment Federation and Friends of Earth. The group published a public information leaflet on 14 December, to be distributed to those affected by aircraft noise. An early day motion is also being put down, calling for the early implementation of 1993 Department of Transport proposals placing a duty on all airport operators to reduce noise to the minimum practicable. The Roundtable are also planning to press for the implementation of measures set out in the Integrated Transport White Paper - including effective enforcement of noise standards and the development of a coherent policy for airports. For more information contact: Karen Johnson, Airports Policy Consortium, Tel: 0181 541 9459 or Tim Johnson, Aviation Environment Federation, Tel: 0171 329 8159.

INDEX OF NSCA POLICY PAPERS

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Please contact Sally May at NSCA on 01273 326313, Email admin@nsca.org.uk if you would like a copy of any papers listed below which have not been published in Clean Air.

1. ***Consultation for Local Air Quality Management*** - written for the national Air Quality Forum and presented on 8th July 1998, this document was also published in *Clean Air* (Volume 28, Number 5).

2. ***Review of UK National Air Quality Strategy*** - the briefing note was published by the NSCA in October 1997 and came in response to the announcement by the Government that the review was underway. The review of the Strategy is expected to be completed by the end of 1998.

3. ***Response to the Consultation Paper Review and Assessment: Pollutant Specific Guidance*** (summary of main points and main paper) - submitted to DETR in June 1998 this paper deals with the major concerns of the Air Quality Committee about the consultation draft of this guidance; it was also published in *Clean Air* (Volume 28, Number 5).

4. ***Pollution Control in Northern Ireland*** - this selection of documents charts the NSCA's recent work on achieving parity for air pollution legislation in Northern Ireland in relation to the rest of the UK. The work came in response to a request from the Society's Northern Ireland Division and the documents include

correspondence and press articles not written by NSCA staff.

5. Cleaner Air: the Role for Cleaner Fuels (summary) - this is the first report of the Cleaner Fuels Forum, a body sponsored by the NSCA and comprising many of the leading organisations in the field and it marks an important step forward in the development and acceptance of alternative fuels in this country. The full report is available at a cost of £25.

6. Reducing the Environmental Impact of Vehicles in Urban Areas - this paper forms the project brief for the Low Emission Zones Project, the next stage of the work of the Cleaner Fuels Forum. The project is well underway and the final report is expected in Summer 1999.

7. Developing an Integrated Transport Policy: an Invitation to Contribute - written in response to the consultation paper on the Integrated Transport Strategy in November 1997, this paper reflects the concerns of the NSCA in relation to transport policy at the time.

8. Local Environment Management Forum, an Introduction to the Aims and Objectives of the Forum - ratified by the Forum in April, this document sets out the NSCA's thinking on local environmental management and develops a framework for the work of the Forum.

9. Sustainable Development: The Next Steps and ***Sustainable Development: Achieving Progress*** - both documents are responses to the draft UK strategy for sustainable development, *Opportunities for Change*, and arose from the work of the Local Environment Management Forum. The former deals with the issue in a national basis whereas the latter takes a more local angle and was submitted specifically on behalf of the Forum. *Sustainable Development*: Achieving Progress was also published in *Clean Air* (Volume 28, Number 4).

10. Sustainable Development Strategies - this document is a report to the Council of the Society, received in September 1998; it builds on one of the recommendations in *Sustainable Development*: *Achieving Progress*, namely that local authorities should have a mandatory duty to produce local sustainable development strategies. The report was also reproduced in *Clean Air*, Volume 28, Number 6.

11. Memorandum to the Urban Task Force - when the Government established the Urban Task Force, it presented the Local Environment Management Forum with an excellent opportunity to raise its views on environmental management in an urban setting at a Government level. The paper was submitted to the Task Force in September and the Forum is currently considering how to take the issues contained in it forward.

12. Noise Survey 1998 - published by the Noise Committee in June, the survey provides an up to date look at the national noise complaints picture and how it has changed over the last year. The original questionnaire was sent to all local authorities in May and a summary of the findings appeared in *Clean Air* (Volume 28, Number 5).

13. Future UK Noise Policy - written in September 1997, this paper looks at recent noise policy developments and some of the upcoming issues and will broadly form the basis of the Noise Committee's work towards a UK National Noise Strategy.

14. Press Releases - a selection of press releases and briefings issued by the NSCA over the last year.

Reports

ENVIRONMENTAL CONSIDERATIONS IN URBAN REGENERATION

Christopher J. Donovan*
Head of Regeneration Bexley Council

At the heart of any effective approach to Urban Regeneration is the need to consider how programmes interlink and co-ordinate with each other. Fundamental to this is that regeneration only works if it lasts through generations - is sustainable. It is why the "exit" strategies of any programme are so important. Furthermore, environmental considerations co-exist with others. Too often emphasis has been placed on environmental and economic development objectives as if they are in direct competition. They are not and realistically never have been.

This paper, which was to have been presented at the NSCA's Conference, Brownfield or Greenfield: Minimising the Environmental Impact of New Development, discusses the assumptions that underpin environmental considerations in regeneration, the context for regeneration activity and key environmental themes; finally, it identifies some important lessons for environmental considerations in regeneration.

1. Urban Regeneration and Environmental Considerations - Some Assumptions

The terms "brownfield" and "greenfield" when talking about development would seem to imply a choice - should we develop on brownfield (i.e previously developed) land or greenfield. Equally it implies consideration of the critical housing issue for the next millennium - whether, and if so how, to accommodate the massive projected growth in households over the next two decades. Reality is of course more complex.

My starting point is that in looking forward we need to ensure future development is more sustainable than much that has gone before. This means:

- the need to ensure a closer relationship between where people live and where they need to travel to meet their basic needs for work, to shop and to obtain services. By the latter, I mean everything from social services, benefit offices, banks, building societies etc. Leisure is clearly another issue.
- there should be a move towards lowering the need and use of the private motor car and more use of high quality and integrated transport systems;
- reduction in traffic volumes - thereby easing congestion and lowering emission levels .

It would seem clear that, with just these three assumptions in mind, a number of conclusions present themselves. First we need to ensure that sustainable development is achieved in both urban and rural areas. This is not only to realise the likely numbers involved, but also because the relationship between existing settlements and existing and potential public transport facilities becomes critical. Whether the "rural" element should be in new settlements, added onto existing or a combination of the two is the province of others. Within urban areas, the aim is clearly to achieve as much development as possible on brownfield sites.

However, brownfield sites in urban areas are by definition the most difficult. Land values and site premia are such that if they were not, they would already have been developed. What is left is land that is in a complexity of ownership, often with difficult physical constraints to development. It is for this reason that, in its approach to responding to the Government's "Planning for the Communities of the Future" and the Urban Task Force, the Royal Town Planning Institute (RTPI) has established a number of task groups to look in more detail at various aspects of this. One, chaired by the senior Vice President is looking into the whole issue of the way that Compulsory Purchase Order (CPO) powers are being used and whether they could usefully be streamlined. It has already found out, from a survey of local authorities, that 40% have given up using CPO powers, because of lack of finance or simply "loosing the habit". It is considered important to look for ways to enhance the use of CPO powers. Local authorities should consider identifying brownfield land for development purposes and, if required, they should then have no hesitation in using such procedures to unlock this development potential. Another group at the RTPI is looking at ways of monitoring the level and type of constraints that exist on potential development land.

Land may also have policy constraints, or have been subject to contamination and dereliction. Proposals will often face local opposition as the idea that regeneration is preferable to the status quo is not an idea shared by everybody.

Current thinking clearly also reflects the need to ensure that regeneration resources are even more focused on communities and people in need. The aim is to support activities which make real and sustainable difference in deprived areas. Programmes are about enhancing employment prospects by increased focus on skills and training. Crime, drug abuse and insecure neighbourhoods need to be tackled, in a coherent and integrated way. Community safety and quality of life are seen as critical indicators, as is the need to reflect aspirations in education (Lifelong Learning, Education Action Zones) housing, and health (Health Action Zones, "Our Healthier Nation" White Paper). Broadly the approach to regeneration should be as comprehensive as possible, reflecting partnership working and in particular the involvement of local communities.

2. Context for Urban Regeneration

Under successive Governments, considerable time is being spent on ensuring that limited resources are targeted on effective regeneration programmes that can deliver measurable and realistic outputs and outcomes. At the heart of the approach of the previous Government was to bring together a wide range of programmes under the umbrella of the Single Regeneration Budget (SRB). An increasingly large proportion of this would be a challenge fund - subject to competition. It was also considered that, contrary to regeneration policies of the 1980s, these could be widely applicable - with all areas of the country able to compete for these resources. In practice, the research into the operational evaluation of the first three years of the programme has found that 80% of the expenditure has been directed to the 99 most deprived districts. Nearly two-thirds of expenditure to the 56 most deprived and over 30% to the 20 most deprived districts in England.

The recent SRB bidding guidance, issued by the DETR, places more emphasis on the need to deliver comprehensive programmes in the most deprived areas. It is seen as an important instrument in tackling social exclusion and promoting equality. Its central priority is to enhance the quality of life of local people in areas of need by reducing the gap between deprived and other areas and different groups. This emphasis builds on the remit of the Social Exclusion Unit, which is to report directly to the Prime Minister on how to:

> "develop integrated and sustainable approaches to the problems of the worst housing estates, including crime, drugs, unemployment, community breakdown and bad schools etc."

The Government clearly envisages that new area based programmes will be needed to turn round, in an integrated way, poor neighbourhoods. Three programmes are specifically referred to:

- *A New Deal for Communities*: Over £800m is to be focused on the comprehensive regeneration of small neighbourhoods. It will bring together all agencies and local people to tackle problems including poor job prospects, high levels of crime, rundown environments and lack of co-ordination.
- *Sure Start:* This new programme aims to support children in deprived neighbourhoods.
- *Single Regeneration Budget:* It is intended to refocus this programme so that 80% of the available challenge resources will be delivered to programmes in the 65 most deprived urban authorities. They will be complementary to other initiatives, such as Employment Zones, Education and Health Action Zones. The remaining 20% will be directed at carefully focused, small-scale schemes tackling pockets of need and deprivation, including rural areas and coalfields. They should be related to other programme delivery wherever appropriate.

The Government has also established the Urban Task Force, under Sir Richard Rogers. This takes as its starting point the need to ensure an integrated approach to urban renewal. It is developed around two fundamental tenets:

- there needs to be positive policies and practical solutions to attract people back into cities, towns and urban neighbourhoods;
- the majority of development should be achieved within urban areas. The development trends that threaten the countryside and saps cities of their vitality need to be reversed. Investing in the city and protecting the countryside are compatible aims.

The aim is to "establish a new vision for urban regeneration founded on the principals of design excellence, social well-being and environmental responsibility within a viable economic and legislative framework."

It is intended to bring together much of this disparate thinking into the first **Urban White Paper** - due early in 1999. The intention, it would seem, is to provide an integrated approach to developing policy on housing, competitiveness, delivery of public services, regional development, transport, community involvement and sustainable development. Lord Rogers has also indicated the need to bring forward the report on the Urban Task Force to help inform this process. The RTPI has been looking itself into the need to produce an urban policy statement, and is currently looking into how best to take this work forward.

Regeneration should be an inclusive process. It should also be about working in partnership to achieve shared goals and objectives. It is not merely about coming together to bid for pots of money. Accordingly, areas are encouraged to develop co-ordinated strategies setting out clearly a Vision for an area, and the action that is needed to achieve the vision. One such action could, of course, be entering into bidding processes. Bexley - an Outer London Borough - is currently undergoing consultation on its regeneration strategy - catchily entitled 'Sustaining Prosperity, Extending Opportunity'. This is a multi-disciplinary and multi-agency approach, involving key players throughout the private, public, voluntary and community sectors. It encapsulates the following seven themes, aimed at enhancing the quality of life for people living, working and visiting the Borough.

- Maintaining and developing a vibrant, sustainable, local economy and good quality jobs.
- Achieving high standards in education and training.
- Improving transport and communication links.
- Enhancing housing, health, leisure and social services.
- Promoting sustainable development and a better quality and safer environment.
- Improving access to information and advice.
- Involving communities in local regeneration.

3. Key Environmental Themes

As Hall and Ward (1998) emphasise, "The central challenge, for the first 20 years of the coming century and probably beyond that, is to deal with an unprecedented growth of new households." Were the 1992 based household projections to be followed we would be having to find housing for around 4.4 million additional households in England alone. This is a 70% increase in the previous 25 year forecast. Even if a strictly 'predict and provide' approach is replaced by one based on 'plan, monitor and manage', there is still a considerable shortage to be met. Almost half the projected increase would be needed in the south-east, already one of the developed world's most densely developed areas. This represents a massive challenge to all of us involved in development and regeneration activities.

As has been seen, there have to be principles guiding the achievement of this growth. The first and most fundamental is **sustainability**. Development has to relate closely to and be developed in an integrated way with transport. It is also why the provision of housing cannot be viewed in isolation from other activities - particularly employment and service provision. In essence an holistic approach to regeneration focuses on people and their needs. Employment opportunities need to be planned with housing developments and the associated transport to facilitate accessibility. Effective regeneration requires understanding the complexity of people's skills and training requirements to gain access to new and existing employment opportunities. Local authorities, the Training and Enterprise Councils work closely in partnership with private, public agency and voluntary and community sectors to enable such programmes to work.

In broad terms, the need to have as much flexibility over the use of land becomes paramount. Constraints to development need to be overcome. Land must be recycled that is currently **derelict and contaminated**, otherwise the pressure on greenfield land, both within urban and countryside areas, will become intense. The Environment Act 1995 includes provision for extensive clean-up powers for contaminated land. New statutory powers are being considered, but until the guidance is finalised and legislation brought into effect there is a degree of uncertainty which is stifling redevelopment.

Clearly liability and the cost implications of remediation are an important constraint, although assistance is available in the form of Government support. English Partnerships can help facilitate development by assisting in bridging the gap between normal development costs and those relating to derelict and contaminated land. From 1 April 1994, it took over the financing regime of the Derelict Land Grant Programme. New arrangements introduced, notably the Land Reclamation Programme, form part of a total annual budget of £250m.

The Government has also proposed measures to prevent future dereliction through the planning system. Environment Circular 2/98 issued in January this year reiterates existing powers available to planning authorities and suggests that the prevention of future dereliction may be a material consideration in planning decisions as it can:

> '... help ensure the future amenity of an area and influence the area's ability to attract future development.'

The Circular also proposes an extension of the procedures currently applied to the future use of disused mineral sites, namely that planning authorities may wish to discuss with some developers the future use and aftercare of a site when it has come to the end of its economic life.

Of course, the ultimate expression of sustainable development would be to 'live over the job'. The Unité d'Habitation in Marseilles, developed by Le Corbusier as a self sufficient neighbourhood community (collective urban life) in the late 1940s, is a more ambitious form of this. Today we think more in terms of **mixed-use** developments. There is currently a pressure to review "unviable", non-housing allocated land uses for releasing for housing. This needs to be reviewed carefully. A proper and thorough approach to development planning would include an assessment of how much land is required for various critical uses. The indiscriminate re-allocation of particularly employment land would not be advisable, nor as shown above would it be very sustainable. Housing and employment land allocations need to be closely inter-related. Assessing the potential and role of mixed use development is one of the leading priorities for the planning system, as set out in Planning Policy Guidance Note 1 (PPG1). However, there can be considerable resistance to such areas in practice. Many people just do not like living close to shops, employment activities - let alone leisure activities. This may be partly a characteristic of suburban living, but five years working in Westminster, earlier in my career, suggest to me it is more about the fundamental mistrust of living in urban areas.

This is why, as the Urban Task Force prospectus has indicated, it is necessary to address the reasons why people want to live away from cities and why we need to radically improve the quality and service of our public transport; reduce congestion and pollution; rekindle interest in the public domain; provide enhanced social facilities; and increase feelings of safety and security in our urban areas.

Good regeneration schemes need to be tested against their **urban design aspirations**. Consideration is being given to ways to ensure the design of new housing schemes do not continue to be dominated by the need to accommodate the private car. In particular, it is considered essential to move away from rigid adherence to fixed design principles. A recent publication "Housing Layouts - lifting the quality" reflects the close working relationship between Government, the Planning Officers Society and the House Builders Federation. It addresses the need to provide higher quality and more imaginative housing layouts and design. Ostensibly about improving quality of life, it also reflects the realistic necessity of considering the potential for higher density, brownfield developments. The reports sites three significant obstacles to lifting the quality of layouts:

- rigid interpretation of highway standards
- developers' reliance on standard housing types
- rigid dimensional planning standards.

Rather neatly it therefore blames each of the main supporters for one of the problems. Part of the solution is seen in much closer co-operation between developers and local authorities, both in providing development/planning briefs for appropriate sites and in raising the expectations above the minimum, by establishing quality objectives.

Local Highway Authorities are also being encouraged to adopt a more flexible approach. A recent publication for the DETR, "Places, Streets and Movement" by Alan Baxter Associates, uses case examples to show how more flexibility can be built into individual developments. The "Planning for Communities of the Future" document itself cites a report by Llewelyn-Davies consultancy for the London Planning Advisory Committee on 'Sustainable Residential Quality'. This adopts an altogether more radical, and not necessarily desirable or realistic approach. Going beyond seeking to accommodate the car, this attempts to show how far higher density development can be achieved by effectively designing the car out completely. Clearly its objectives have some relevance to the regeneration of certain urban sites with excellent public transport access. However, the danger of going this far is that it could be seen to lack realism in more general applications, and thereby gaining 'hearts and minds' and commitment will be extremely difficult.

Another critical consideration for successful urban regeneration projects is **image**. The playing field is not level. Investment can be deterred by both a real and/or perceived poor image and quality of environment. Often this needs to be addressed at quite a high level. In Regional Planning Guidance for the South-East there is an emphasis on providing high quality environments and in shifting development pressure from the west to the east of the region. At the heart of this approach was to identify a number of sub-regional priority regeneration areas. Arguably the most important and radical of these is the area stretching on both sides of the Thames from Inner London to the estuary - known now as Thames Gateway. The area historically has a relatively poor image, certainly in comparison to Central London and the M4 corridor to the west of London.

The reasons for this are complex. Some of it is real, some of it is perceived. Nevertheless, over the last five years considerable effort has gone into addressing this image problem. In part it relates to skills and training levels of local people, low educational achievement levels, relatively poor health - particularly respiratory illnesses, and high concentrations of deprivation in communities throughout Thames Gateway. The area has secured considerable regeneration resources to help address these issues, over the next ten years. Also, however, there is considerable concern about the environment of Thames Gateway. Indeed, for many years planning policies and Government decisions have meant that the area has become something of a dumping ground for the power stations, waste incinerators, land fill sites, sewage works etc that are all necessary to support London and the South-East economy - but which nobody wants in their area. As a result the area suffers physical dereliction, poor air quality, profusion of overhead power-lines and areas of generally poor environment. Clearly, for Thames Gateway to be successful as a regeneration area, a completely new and innovative approach had to be adopted to restore and enhance its image.

The planning framework for Thames Gateway emphasises this point. It states that "The full potential of Thames Gateway will not be realised without a new approach of greater care for the environment." In order to achieve this objective, and thereby break out of the self-reinforcing cycle of environmental blight which affected much of the area, a new environmental standard has been applied. The fundamental aim is to ensure that any development/regeneration proposal in Thames Gateway has to be mindful of the key assets of the area. Economic and social regeneration and environmental improvement are thus seen as complementing and self-reinforcing goals.

Finally it is worth noting that there is a call for Government to revise its **planning guidance (PPG3) on housing**. In particular it is suggested that it should:

- give clear guidance on the location of housing in relation to Government's policy on integrated transport and sustainable development - together with sustainability criteria;
- clear guidance on the implementation of a sequential approach to housing development. In particular the need to focus on the recycling of derelict and other brownfield land first, as part of assisting urban regeneration and promoting sustainable patterns of development. Without such a sequential approach, it is debatable whether pressure to develop greenfield land can be resisted;
- local authorities to undertake urban capacity studies;
- adopt appropriate (i.e higher) densities and car parking standards (i.e lower) on urban and greenfield locations;
- local authorities to undertake environmental capacity studies;
- clear guidance on how local authorities should ensure a mix of housing types, themes and densities.

4. Conclusions - Some Important Lessons For Environmental Considerations of Regeneration

Regeneration is about quality of life for all people. It is by definition inclusive. It is about ensuring a synthesis of social progress recognising the needs of everyone, effective environmental protection and prudent use of natural resources, whilst maintaining high and stable levels of economic growth and employment.

The context for successful regeneration is its contribution in helping to tackle social exclusion and promote equality. It is about improving the quality of life in areas of need and reducing the gap between deprived and other areas and different groups.

The key environmental considerations of successful regeneration tend to revolve around the ideas of sustainability and sustainable development.

The environment, as with land, is in its broadest sense, a finite resource - the preservation of which is critical to survival. Effective regeneration thus needs to emphasise making more and better use of scarce resources. In particular, it needs to ensure a closer relationship between the key activities people need to engage upon - in other words to at least reduce reliance in long distance travel using the private car. Communities also need to be balanced - so the focus needs to be on employment as well as housing.

At the strategic level consideration needs to be given to the critical relationship between transport and land use, and how they can best be integrated, at national, regional and local level. Planning and transport decision makers need to work together to ensure development decisions and transport investment decisions lead to more sustainable patterns of development and travel patterns.

At the local level, more radical approaches will be needed to assess the environmental impact of development proposals. Successful regeneration of urban spaces is likely to require imaginative and innovative urban design solutions. Careful consideration will need to be given to varying rigid density, to be more flexible, if we are to create human scale and interesting urban environments.

We must rediscover the confidence in developing urban areas and cities for the future. Mixed use zones are likely to play an increasing role, but only once people have been convinced that they can produce positive and quality living conditions.

> "A well designed city is also a just city, based upon the twin principles of inclusion and solidarity. The quality of people's living environment has a direct impact on their physical, mental and emotional health."
>
> *Urban Task Force Prospectus.*

It has been a long time coming - but at last we seem to have arrived at the realisation that we can no longer be complacent about the fate of our cities and urban areas. If the development pressures of the early part of the new millennium are to be met without environmental, social or economic collapse, we need to act fast to ensure the survival of cities and urban spaces as places people aspire to live and work in, not to leave. The integrated thinking and complex interrelationship and partnership working that characterise successful regeneration, play a full part in this analysis. The urban renaissance has to be achieved - the alternative really doesn't bear thinking about.

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The Mass Concentration and Size Distribution of Particles in Central London using Non-Continuous Gravimetric Sampling Techniques

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This report presents summary data from particulate monitoring programmes undertaken by the London Borough of Camden and the City of Westminster. Measurements were made using Cascade Impactors and Partisols, to give data on temporal and spatial variations on the mass concentration and size fractionation of particles in central London. Comparisons were also made between gravimetric and continuous samplers.

INTRODUCTION

The Environment Act 1995 set out new responsibilities on local authorities to review the air quality in their areas within two years and assess it against a set of national standards, which were subsequently published in the National Air Quality Strategy (NAQS) with associated objectives [1]. The standard for particles less than 10 microns (PM_{10}) was fixed at 50 μg/m^3 measured as a 24-hour running mean, with an objective to be reached by 2005 of 50 μg/m^3 measured as the 99th percentile. The standard for PM_{10} poses the most problems for local authorities since there are widespread exceedences across London, and control is difficult due to the number of different sources. The London Borough of Camden and City of Westminster have already completed the initial stages of their Review and Assessments[2,3] which found considerable breaches of the standard at both roadside and background locations. Both have progressed to a Stage 3 Review and Assessment for this pollutant.

Although road transport constitutes the largest source of PM_{10} in London, accounting for 77% of total emissions[4], there are a number of industrial processes within the King's Cross Railway Lands which give rise to considerable dust emissions. Camden Council's particulate monitoring programme was therefore established to collate data on the mass concentration and size distribution of particles from both industrial and traffic sources in the King's Cross area, and attempt to identify those sources which might result in elevated PM_{10} concentrations. Levels of 'nuisance' dust in the King's Cross Railway Lands has been reported previously [5].

Westminster's monitoring programme has concentrated on monitoring PM_{10} concentrations in some of the City's busiest locations to assess exceedences of the air quality standard, and also to assess the impact of cleaner vehicle technologies in terms of reduced PM_{10} emissions.

Due to the different objectives of the two Council's monitoring programmes, methodologies and results are presented separately for each Council in this paper.

LONDON BOROUGH OF CAMDEN

Sampling Methodology

Particulates were sampled using an 8 stage Graseby Andersen cascade impactor, which operates at a flow rate of 28.3 l/min. Air is drawn through a pre-separator to remove particles larger than 10 μm, allowing particles to be then separated into 8 different size categories with upper cut points ranging from 10 μm down to 0.4 μm. The particles were collected onto quartz fibre filters to minimise artefact formation, and sampling was carried out over seven day periods in order to obtain sufficient mass on each stage. Particles less than 2.1μm are referred to as 'fine' particles in this study, since there is no cut point at exactly 2.5 μm.

Filters were conditioned for 24 hours before weighing in a constant humidity dessicator operated at approximately 20°C and 50% relative humidity. Filters were again conditioned for a further 24 hours after sampling. After conditioning, the filters were weighed on a Satorious R160D balance to 0.01 mg.

For the period June 1996 to December 1996 one cascade impactor was located on the balcony of St Pancras Chambers which overlooks Euston Road at a height of approximately 10 metres. Euston Road is a major trunk road carrying over 60,000 vehicles per day, so this site was therefore representative of a busy road side location. The impactor was later re-located to the roof of the Town Hall on Euston Road at a height of three storeys, and used to measure particulate concentrations continuously from June 1997 to October 1998. This site is directly opposite St Pancras chambers, but due to the increase in height is more representative of an urban background location.

A second impactor was then positioned from July - September 1997 on a one storey building in Camley Street Natural Park which is situated opposite two waste transfer stations. The waste transfer stations take commercial, non-putrescible waste only. This impactor was then repositioned in York Way Transport Depot from October - December 1997 onto the roof of a one storey building. Apart from the proximity to fleet vehicle activity in the depot, this site is also situated close to a busy road and a number of cement and concrete batching plants in the King's Cross Railway Lands. In both cases the impactors were positioned in areas where there was the potential for public exposure. Camley Street Natural Park is open to visitors, most of whom are school children, and there are a number of residents who live on houseboats at the edge of the site. York Way Transport Depot is also staffed during normal working hours.

Comparison of impactor PM_{10} concentrations at the Town Hall from October 1997 to September 1998 were made between the Bloomsbury AUN site in Russell Square gardens which is located approximately 800 metres away. This was the nearest representative station where continuous PM_{10} data was available for the TEOM (Tapered Element Oscillating Microbalance). In addition, further comparisons were made between a co-located Beta Attenuation Monitor, the BAM-1020, over a shorter time period of April to July 1998.

Results

Mass concentration and size distribution of particles at roadside locations

Figure 1 shows weekly mean particle concentrations measured with the Cascade Impactor at Camden Town Hall on Euston Road. The 'Summer' period is defined as the start of April to the end of September, and the 'Winter' period is the start of October until the end of March. Summary statistics for this period are shown in Table 1.

Weekly average PM_{10} concentrations ranged from 24 to 64 $\mu g/m^3$ at St Pancras, and 35 to 90 $\mu g/m^3$ at the Town Hall. The maximum concentration of 90 $\mu g/m^3$ was recorded during the pollution episode in November 1997 which was caused by a combination of bonfire activity and traffic emissions. Maximum $PM_{2.1}$ and $PM_{1.1}$ concentrations of 63 $\mu g/m^3$ and 46 $\mu g/m^3$ were also recorded during this week.

When the average concentrations of PM_{10} at both St Pancras and the Town Hall were compared with corresponding PM_{10} concentrations at the Bloombury monitoring station, concentrations at St Pancras were 8% higher. Closer analysis of the size distribution of particles (see figures 2 and 3) shows that both sites exhibit a trimodal distribution, but there is a marked increase in particle mass in the smallest size range, ‹0.43μm, for St Pancras. This clearly shows that emissions of submicron particles from motor vehicle exhausts accounts for a significant fraction of the PM_{10} at the roadside. The absence of such a defined peak at the Town Hall site indicates that these smallest particles are transient in nature, and have undergone partial agglomeration in the atmosphere.

Overall PM_{10} and $PM_{2.1}$ concentrations at both sites follow the same trend, since the fine particles constitute the largest fraction of PM_{10}. $PM_{2.1}$ accounted for 56% of the PM_{10} mass on average at St Pancras during the summer period, reaching a maximum of 64% during mid December 1996. The compares to an average 53% at the Town Hall over the two summer periods, and a maximum of 69% which was recorded in September 1998. During the winter months the average rose slightly to 56%, and a maximum $PM_{2.1}$ contribution of 70% was recorded during the pollution episode of November 1997. These results are comparable to previous studies in urban areas[6], although the percentage of fine particles to PM_{10} mass in the winter period is slightly lower than might be expected. This is most likely due to height of the Town Hall and its distance from the road.

Concentrations of $PM_{1.1}$ were also found to contribute significantly to the PM_{10} mass in both summer and winter months. During the November 1997 episode, $PM_{1.1}$ accounted for 51% of the mass and in August 1996 concentrations of $PM_{1.1}$ was found to contribute 52% of the mass. The summer maximum occurred during a period of photochemical activity[7] so secondary aerosols are likely to have been a major component of the $PM_{1.1}$ mass at this time.

Table 1. Seasonal variations in PM_{10}, $PM_{2.1}$ and $PM_{1.1}$ concentrations at St Pancras Chambers and Camden Town Hall 1996 – 1998.

	PM_{10} concentration			$PM_{2.1}$ concentration			$PM_{1.1}$ concentration			Data Capture
	Min	Max	Mean	Min	Max	Mean	Min	Max	Mean	
Summer 1996[1]	33	64	44	17	41	25	13	33	20	54 %
Winter 1996-97[1]	-	-	-	-	-	-	-	-	-	Insufficient data
Summer 1997[2]	24	48	35	11	29	19	8	23	15	50 %
Winter 1997-98[2]	15	90	41	8	63	24	6	46	18	81 %
Summer 1998[2]	24	61	35	11	42	18	9	27	14	88 %

[1] Impactor located at St Pancras chambers [2] Impactor located at Camden Town Hall
Note: All results are mean weekly particle concentrations ($\mu g/m^3$).

Mass Concentration and Size Distribution of Particles Close to Industrial Sources

Figure 4 shows weekly average PM_{10} concentrations at Camley Street Natural Park and York Way Transport Depot. The Town Hall is used as a reference site. It can clearly be seen that the PM_{10} concentrations at Camley Street are much higher than for the Town Hall, indicating another source of particulate matter other than road traffic. Concentrations at York Way however show very good agreement with that of the Town Hall.

When the size distribution of particles was plotted for both sites (figures 5 and 6), the profiles were very different. This clearly shows that different particle sources have contributed to PM_{10} mass at the two sites.

Camley Street Natural Park is situated opposite two waste transfer stations (one of which has since ceased operation) and in contrast to the two other sites shows a much higher percentage of particles in the coarse fraction (60%). Activities at these sites involve moving and impacting the waste, thereby resulting in significant quantities of dust to be generated. Despite the presence of water sprays at the perimeter fence and trees at the edge of Camley Street Natural Park a considerable proportion of the dust particles generated were transported into the grounds of the Natural Park opposite, resulting in higher PM_{10} concentrations compared to the Town Hall. Although it is difficult to assess exceedences of the air quality standard from the impactor data, it is clear that localised breaches of the standard would result from concentrations in the range observed during the study. Local authorities should therefore be aware of the potential for such industrial processes to give rise to elevated PM_{10} concentrations when carrying out their Review and Assessments. Should the Government decide to move towards a different standard based on $PM_{2.5}$ measurements, such sources should not constitute a problem.

The impactor located close to the cement batching plants at York Way Transport Depot did not show such a marked elevation in the coarse component as for Camley Street Natural Park. Concentrations in this fraction were however marginally higher when compared to the Town Hall, indicating that road dust from the Railway Lands or emissions from cement batching plants were contributing to PM_{10} concentrations in the area. It is difficult to identify the cause of the particles, since there are a great deal of vehicular movements close to the York Way Depot resulting from the transportation of materials into and out of the Railway Lands. These movements often generate large quantities of dust since the road is poorly maintained. Further analysis of dust samples using SEM techniques might give some indication of the source of these particles, and the potential to implement control measures.

In contrast to the variation in coarse particles at each of the locations, fine particle concentrations were similar at all four sites, irrespective of proximity to major roads or industrial activities. This clearly illustrates the uniformity of $PM_{2.1}$ concentrations across large areas, and that particle emissions from the waste transfer station, cement batching plants or roadway made no contribution to the $PM_{2.1}$ fraction.

Comparison of cascade impactor measurements with continuous monitoring techniques

Detailed comparison between cascade impactor measurements and the Bloomsbury monitoring site were undertaken for one complete year, from September 1997 to August 1998. Weekly average concentrations were calculated for the Bloomsbury site to coincide with the sampling period used for the impactor. Comparison of this data is shown in figure 7. There is generally good agreement between these instruments, although there is a marked difference in concentrations during periods of elevated PM_{10} concentrations. Over the one year period the impactor recorded concentrations 50% higher on average, but during the November 1997 episode this rose to 80%. Further analysis of the data showed that when the difference between the impactor and the TEOM measurements for each week were plotted against the corresponding $PM_{2.1}$ fraction there was a good correlation $r = 0.86$, despite the difference in location between the two sites. This indicates that the TEOM consistently under records when high concentrations of fine particles are present. This has been investigated previously[8,9] and attributed to the loss of volatiles and hydrocarbons whilst passing through the heated TEOM inlet.

Figure 8 shows a comparison of PM_{10} concentrations between the Town Hall cascade impactor and a co-located BAM from April to July 1998. The average PM_{10} concentration between the impactor and the BAM recorded during the sampling period was 34 and 35 µg/m^3 respectively showing a good comparability overall, and a good correlation of $r = 0.95$ was observed when the two sets of data were plotted against each other. The BAM did however have a tendency to read considerably higher during elevated PM_{10} concentrations, by up to 18 µg/m^3. This may be due to a number of factors such as the use of a non heated inlet on the BAM resulting in collection and measurement of water vapour, or loss of volatile compounds from the impactor filters as a result of the long sampling period used. These differences are worthy of further investigative work, and should involve the comparison of the BAM against a gravimetric sampler using 24 hour measurements. This work is currently being undertaken by the South East Institute of Public Health at the Marylebone Road 'Supersite' and the results are due to be reported later in the year.

CITY OF WESTMINSTER

Sampling Methodology

In Westminster sampling of fine airborne particulates has been mainly carried out using the *Partisol Model 2000 Air Sampler*. This is a microprocessor controlled manual sampler having the capability of recording exact sampled volumes, with temperature and pressure correction. The sample volume data are held in internal memory for subsequent retrieval.

By using a variety of sampling heads it is possible to collect PM_{10}, $PM_{2.5}$, PM_1, or total suspended particulates (TSP). These are collected on a 47 mm Teflon (PTFE) filter, which is weighed before and after exposure. Experience has shown that PTFE filters are not affected by moisture and hence filters are not conditioned. Furthermore an inter-laboratory comparison between Westminster, Camden and Kings College all showed excellent comparability between weighing of 'clean' and 'exposed' filters. Laboratory conditions are checked and recorded and have found to be stable at around 20°C and 60% relative humidity.

More recently the Partisol samplers have been set up in a hub/satellite configuration in which the airflow alternates between a main unit and a slave unit. This allows samples to be taken from midnight to midnight, rather than filters being changed at different times during the working day. Until the hub/satellite configuration was implemented, filters were exposed for 24 hours from approximately mid afternoon, from day to day, although this varied for operation reasons.

An extensive database has been built up over the last 4 years and only a small part of the total has been reported on here. Sampling sites reported in this study include: Oxford Street, Oxford Circus, Regent Street, Paddington Station and Trafalgar Square. More recently a site has been established in the centre of Hyde Park to allow PM_{10} levels to be measured at a 'rural' central London location, but one that is well away from any busy road (the nearest being Bayswater Road, 350 metres to the north).

Results

Fine particulates have been measured in Oxford Street using the Partisol 2000 sampler since November 1994. This project was set up following concerns over pollution levels in the street, generated from buses and taxis. The unit is located opposite to the main entrance of Selfridges department store on Oxford Street. This end of Oxford

Street is perhaps less congested than the Oxford Circus end of the road but it still has a daily traffic flow of between 12,000 and 14,000 vehicles per day. The vehicle mix is mainly comprised of diesel engined vehicles. This is made up of buses and taxis with some delivery vehicles and a few cars entering from side roads or illegally from either end of the street.

As there are now over four years of data available it is possible to look at long term trends. Figure 9 below takes the daily means from Oxford Street over the entire sampling period to illustrate the wide variance in concentrations that are experienced. Figure 10 reports the same data from Oxford Street as the trendline. Swiss Cottage TEOM data is used as a base reference[10]. Data from Bloomsbury also shows a similar gradient but has not been shown here.

It can be seen that there has been a general downward trend in PM_{10} concentrations over the sampling period. The improvement over the long term is very encouraging. This will need some closer scrutiny and statistical evaluation before it can be stated that there has been a definite reduction in fine particulate levels in Oxford Street.

An assumption as to the reasons why there may have been an improvement in air quality is the recent clean fuel and engine initiatives undertaken by the London bus companies plus the greater emphasis on vehicle emission enforcement which have now begun to show dividends. This is an area for study that will be investigated further.

The council's traffic engineers undertake many traffic management programmes throughout the city. One such scheme was the installation of improved bus lanes in Regent Street. The Transport Policy division of Westminster council asked the Noise and Pollution Business Unit to look into whether there were any 'before and after effects' on air quality by the bus lane changes. The first study took place in 1996 and the second in 1997. The study also showed elevated levels of PM_{10} relative to Oxford Street. The main reason for this is that Regent Street has a traffic flow of about 25,000 vehicles per day, double that of Oxford Street. The sampling site was also close to Piccadilly Circus, a notoriously congested area.

Comparison between the two periods shows that the concentrations of PM_{10} are largely unaffected by the addition of the bus lane. Average concentrations for the two sampling periods were 74 µg/m^3 in 1996 and 75 µg/m^3 in 1997.

At the Selfridges, Oxford Street site the PM_{10} sampling head was replaced with a $PM_{2.5}$ head for five months to investigate particle size distributions. It is interesting to note that there appears to be only a slight difference in the two data sets. The overall average concentration with a PM_{10} head was 46 µg/m^3 and 42 µg/m^3 for $PM_{2.5}$. This would tend to indicate that the main contribution to PM_{10} in Oxford Street is smaller particles, largely from primary sources. Ideally two samplers would need to be co-located over the same time periods for the most statistically robust results. Nevertheless, these measurements suggest that a large proportion of fine particulates are in the smaller particle size ranges at this kerbside location, which is consistent with previous reported results[6]. These results are illustrated in figure 13.

A study was carried out in 1996 to compare the reduction in PM_{10} levels with distance from the kerbside. To facilitate this a second Partisol was set up in Balderton Street, a side street off Oxford Street, some 10 metres away from the kerbside monitor, opposite Selfridges. The results are shown in figure 14.

As would be expected there is a decrease in concentration away from the kerbside. Average for the 6 week period was 48 µg/m^3 in Balderton Street and 73 µg/m^3 over the same period at the kerbside in Oxford Street. This is approximately a 30% in decrease in concentration with increasing distance from the road. The 99%ile was 110 µg/m^3 although only 41 sample days were covered (Table 1).

Monitoring carried out on the station concourse in Paddington Station (see Table 1) showed extremely high levels of PM_{10}. Mean concentrations of 118 µg/m^3 were measured with 99%iles of sampled data being 171 µg/m^3 This concentration is over three times that of the air quality standard and the highest that have been measured in Westminster. In common with Kings Cross Station in Camden, Paddington Station is one of the few stations in London that still uses diesel locomotives.

Trafalgar Square is one of the most traffic polluted areas of central London. It is also one of the Millennium World Squares and there are proposals to pedestrianise part of the area. The main impact on traffic will be the paving of the area between Nelson's Column and the National Gallery. As part of a 'before' study a Partisol was installed on the kerbside outside the National Gallery during the summer of 1998.

The question of urban background levels of PM_{10} has often been raised. There has been much sampling at roadside and kerbside locations, but there is little data at background locations well away from local sources; for example in a park. Therefore permission was obtained from the Royal Parks to install a Partisol in the centre of Hyde Park. Results from the park are shown in figure 15, alongside the Trafalgar Square results to illustrate the contrast between the two locations.

As expected concentrations of PM_{10} are lower in the park but still show levels above a rural background. It is currently unclear as to whether these levels are due to the urban background particulate levels or from more local effects such as windblown dust, fungal spores and locally generated particulate. Some further work will also be required to look at the correlations between widely dispersed sites. Preliminary calculations suggest that the Partisol data do not have such good correlations as dispersed TEOM sites.

The current air quality standard is defined as the 99th percentile of running 24 hour mean of hourly averages[1]. This standard is an extremely difficult one to deal with for several reasons. Firstly it relies on a rolling mean of hourly averages as the base data set. Because of the discrete nature of the Partisol results this is not as straightforward as using say, TEOM data, where hourly sequential data are available. However by using the formula in the draft DETR Pollutant Specific Guidance[11] for PM$_{10}$ it is possible to extrapolate to give 99%iles.

This formula has been used at each of the Council's monitoring sites to give a PM$_{10}$ concentration for each year. The results of this and other work suggests that when compared to the air quality standards, there are still a significant number of exceedences of the PM$_{10}$ air quality standard in the City of Westminster[2].

The draft pollutant specific guidance also suggests that the concentration of 65 µg/m^3 should be used when comparing gravimetric data with the air quality standards, rather than the 50 µg/m^3 defined in the legislation. The justification for this methodology was based on the difference between gravimetric and TEOM measurements, as discussed earlier in this paper.

Table 2. Summary of Results from Westminster Sampling Programme

DATE	Selfridges	Selfridges	Trafalgar Sq.	Paddington	Balderton	Regent St.	Hyde Park
Mean of all samples	57	42	67	118	48	75	25
Maximum	197	107	151	173	119	148	81
Total days sampled	947	112	141	30	41	294	147
99%ile of all samples	153	94	142	171	110	137	69
No. of exceedences of 65ug/m^3	404	29	97	28	8	253	4
1995; 99%ile using formula	196			225	139		
1996, 99%ile using formula	189					172	65
1997, 99%ile using formula	154	117				179	54
1998, 99%ile using formula	146		184				91

Concentrations in microgrammes per cubic metre

CONCLUSIONS

1. Fine particles of less than 2.1 µm were found to dominate the PM$_{10}$ mass at roadside locations. During summer and winter episode conditions, concentrations of PM$_{1.1}$ were found to account for up to 50% of the PM$_{10}$ mass.
2. Although road traffic in central London and other urban areas is the most significant source of PM$_{10}$, this study showed that local industrial activities can result in elevated particulate concentrations in the immediate vicinity.
3. Whilst the cascade impactor is not a useful tool for assessing exceedences of air quality standards, it has the advantage of giving information on the size distribution of particles, and thus an indication of the source. It is therefore useful for initial surveys where there may be a number of potential sources.
4. Comparisons between the cascade impactor with the TEOM showed that the TEOM consistently under reads during periods of high PM$_{2.1}$ concentrations. In contrast the Beta Attenuation Monitor was found to read higher compared to the impactor.
5. Large numbers of exceedences of the PM$_{10}$ National Air Quality Standard were observed in Paddington Station, Regent Street and Trafalgar Square. PM$_{10}$ concentrations in Hyde Park were the lowest, as would be expected, but exceedences of the air quality standard were still recorded.
6. Some local authorities are finding it difficult to assess exceedences of the air quality standard since the legislation specifies a rolling standard which requires the use of continuous measurement techniques. These are often expensive and non portable. A number of authorities use gravimetric samplers which do not give results that relate directly to the standard, and require the use of surrogate statistics.

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The views expressed are those of the authors and not necessarily those of the two Councils.

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Figure 1 . Weekly PM_{10} and $PM_{2.1}$ Concentrations on Euston Road 1996-98

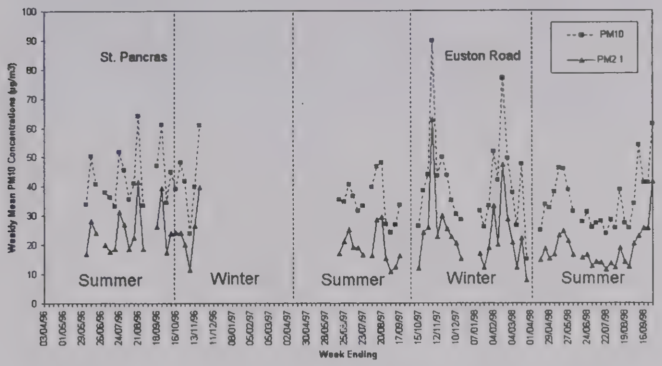


Figure 2. St. Pancras

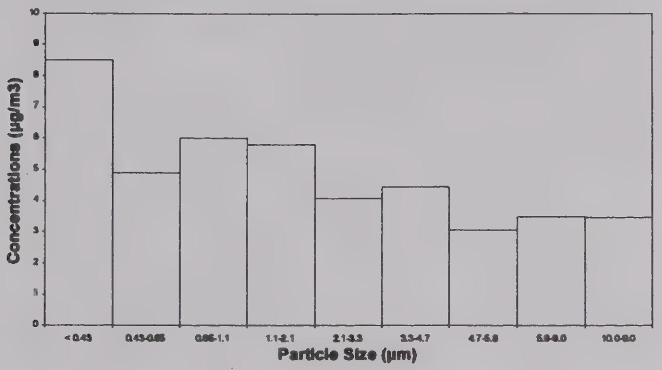


Figure 3. Town Hall

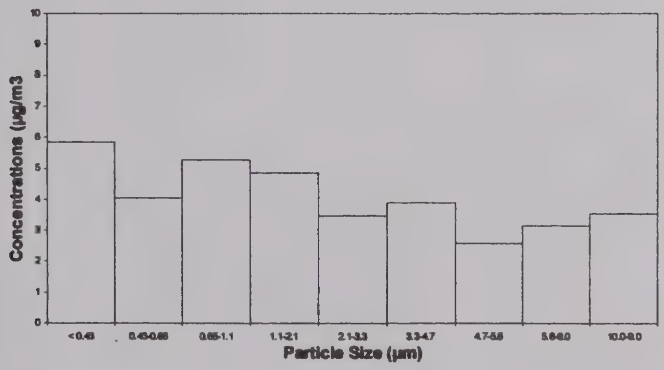


Figure 4. Comparison of Weekly PM_{10} Concentrations at Euston Road, Camley Street Natural Park and York Way Transport Depot

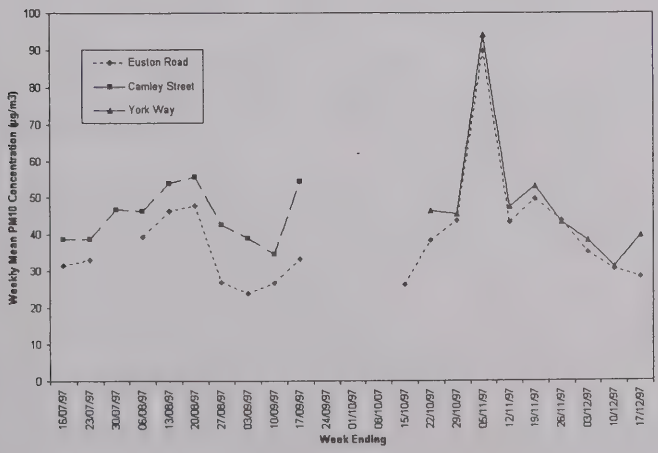


Figure 5. Camley Street

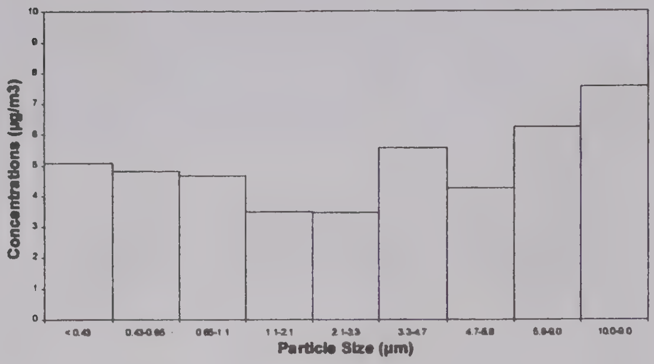


Figure 6. York Way

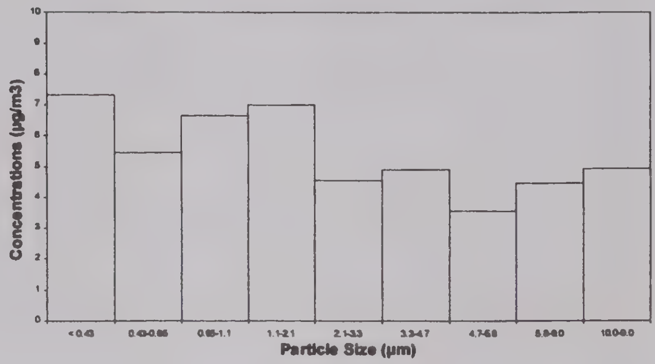


Figure 7. Comparison of Weekly Cascade Impactor and TEOM PM_{10} Measurements

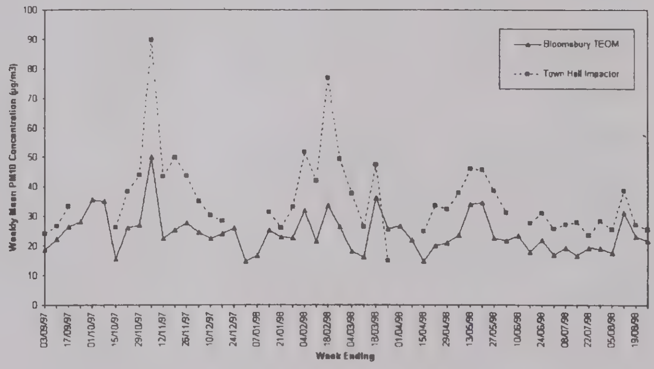


Figure 8. Comparison Between Weekly Cascade Impactor and BAM PM_{10} Measurements at the Town Hall

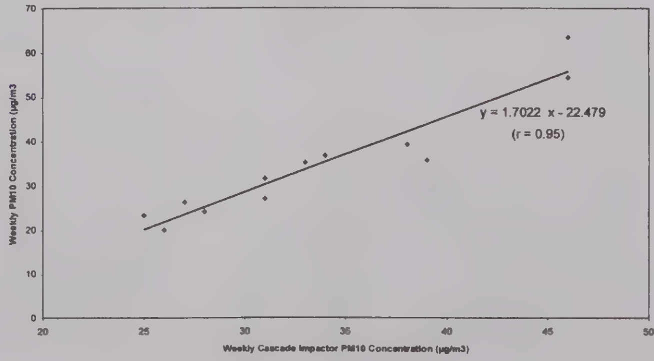


Figure 9. Average PM₁₀ Levels in Oxford Street 1994-98

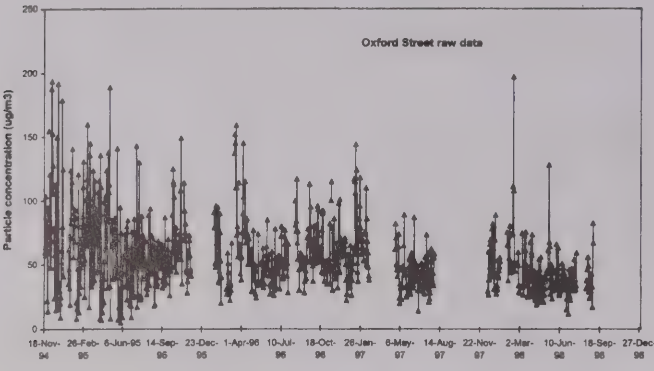


Figure 10. Trendline Showing Decrease in PM₁₀ Levels in Oxford Street 1994-98

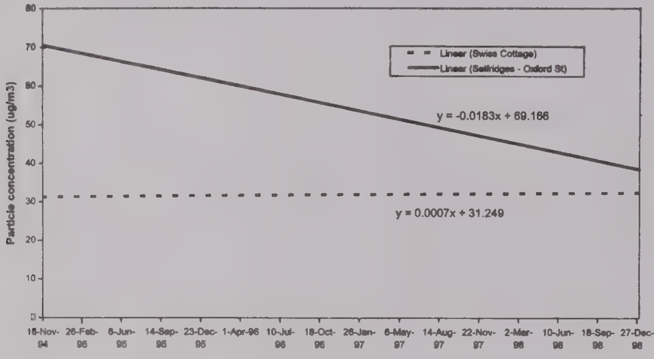


Figure 11. Comparison of Oxford Street and Regent Street Average PM₁₀ Concentrations 1996

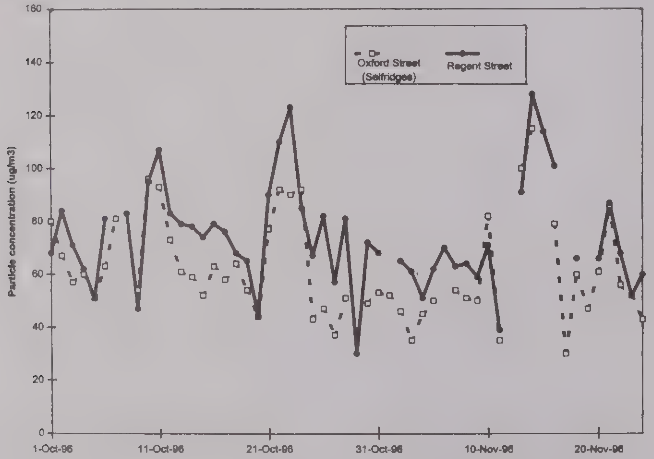


Figure 12. Comparison of Oxford Street and Regent Street Average PM₁₀ Concentrations 1997

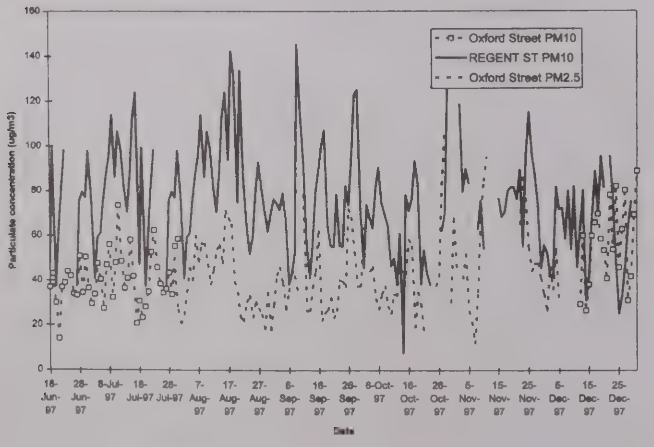


Figure 13. Comparison of Average PM₁₀ and PM₂.₅ Concentrations in Oxford Street 1997

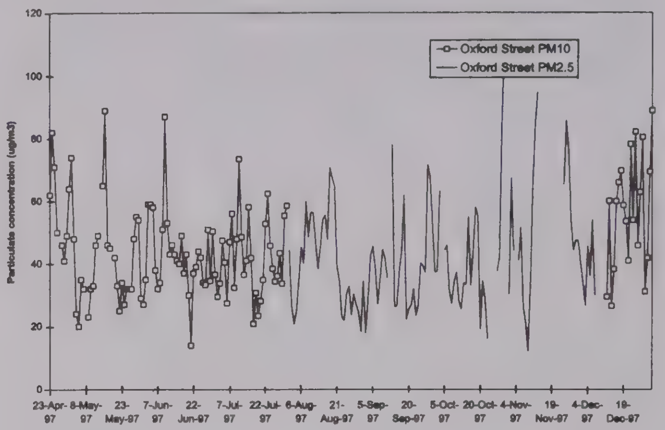


Figure 14. Comparison in Concentrations of PM₁₀ Adjacent To and Away From the Kerbside

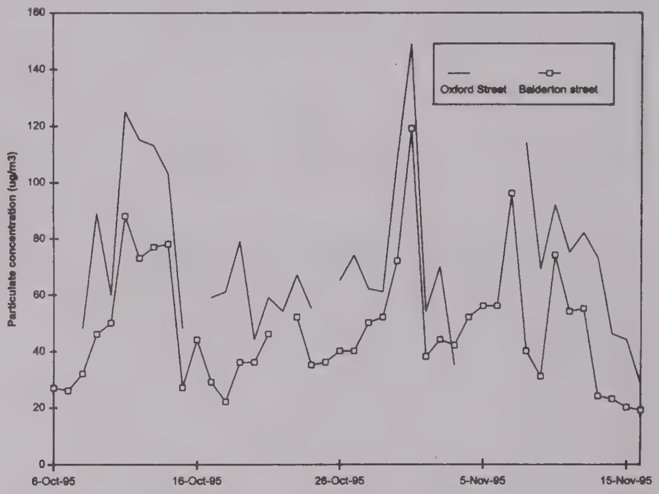
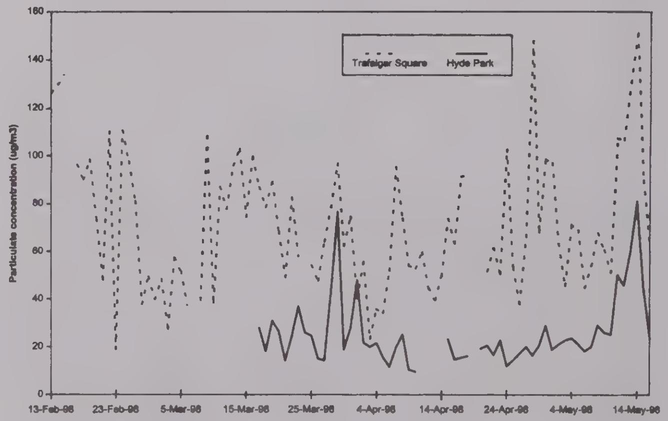


Figure 15. Comparison of Average Concentrations in Hyde Park and Trafalgar Square



Update

Sustainable Development

Planning for the Communities of the Future, published by the DETR in October, provides guidance for local planners and others to plan new housing and other essential new development in a way which better meets the Government's objectives for sustainable development.

The Guide recognises that locating all new development in existing towns and cities is not a practical solution and it suggests an approach to assessing other options such as urban extensions and new settlements. It suggests that authorities should focus development within transport corridors, and ensure that it is accessible by sustainable forms of travel; ideas for reducing car dependence, such as through the design and location of new development, green transport plans and parking strategies, are also suggested.

The Guide emphasises the importance of reviving rural settlements, protecting landscape character and local distinctiveness, and identifies some sustainable development issues which are common to all areas; one chapter deal with how issues such as ecology and energy can be integrated into plans; and a methodology for ensuring that sustainable development principles are integrated from the outset of the plan-making process is proposed.

Copies of the Guidance, priced at £35 are available from the Stationery Office, ISBN 0 11 753406 4.

Monitoring and Reporting on Sustainable Development, published by the UK Round Table on Sustainable Development in November, looks at the part that monitoring and reporting will play in informing and facilitating the transition to sustainable development. The report is the outcome of a seminar convened by the Round Table to agree on the objectives of reporting and the way in which those objectives should be achieved.

The Round Table note that improved monitoring and reporting on Government policies, and on sustainable development more generally, will be essential to hold Government and others to account, as well as to engage all parts of society to communicate and learn; this would ensure that "change in the future will be change for the better". They also recommend that the body responsible for monitoring and reporting should be independent in order to establish and maintain the credibility of reporting.

The Round Table Secretariat can be contacted at DETR, Zone 4/F5, Ashdown House, 123 Victoria Street, London SW1E 6DE; Tel: 0171 890 4964; Email: 106174.2501@compuserve.com

IPPC

The EU's Integrated Pollution Prevention and Control Directive has to be implemented by 30 October 1999; draft regulations were due to be published for consultation during December. Meanwhile DETR has announced that local authorities in England and Wales are to retain responsibility for most of the 1,500 processes currently regulated under LAPC which are due to be regulated for IPPC. As IPPC requires these processes to be regulated for discharges to water, the draft Regulations will require local authorities to refer all applications for a permit to the Environment Agency who will set conditions relating to such discharges. Similarly the Regulations will enable the Environment Agency to consult local authorities when setting conditions relating to noise, which is also a requirement of IPPC.

In Scotland, SEPA will continue to be responsible for regulating all processes covered by IPC, IPPC and LAPC.

Setting Environmental Standards

The 21st Report of the Royal Commission on Environmental Pollution was published in early October. *Setting Environmental* Standards calls for a new approach to deciding environmental policies which, as well as drawing on rigorous and dispassionate analysis, must also show a greater sensitivity to people's values.

The report emphasises that protecting the environment has become much more complex - increasingly the task is to prevent damage which may be global in scale and occur some way into the future; in addition, sustainable development means that pursuing material well-being and enhancing social equity have to be reconciled with protection of the environment. The report also says that bodies which set standards must ensure their procedures are transparent and open at every stage - they must also leave an audit trail recording what factors have been taken into account in setting a standard; and, to facilitate taking people's values into account, environmental standards should be set at the most local level at which it is sensible and effective to do so.

While recognising that there is still an important role for direct regulation of, for example, polluting activities, in future this will only be part of a broader approach which includes green taxes and charges, and voluntary action by corporate bodies and individuals; such an approach makes transparency and openness even more crucial and thus ways must be found to maintain accountability and improve public trust; this, the RCEP says, is likely to involve setting new forms of environmental standard, for example for green claims about products, for environmental reporting by companies, and clear published targets set by government for environmental quality.

Setting Environmental Standards is available from the Stationery Office, Cm 4053, ISBN 0 10 140532 4, price £21.40.

Nuisance Dust Meter

Dr. Michael Schwar, is carrying out a review of the use of the Nuisance Dust Meter over the last ten years. The Nuisance Dust Meter, which was developed in association with Diffusion Systems Ltd in the late 1980s is also known as the Rendel Dust Meter, EEL Dust Meter. Dust levels are assessed in terms of the soiling of clean microscope slides, with the degree of soiling being expressed in soiling units measured by the meter.

Although the Nuisance Dust Meter is used by a number of local authorities and industry it has still not received official recognition. Dr. Schwar hopes to collect information which demonstrates its effectiveness as a tool to aid decision making.

He is interested to hear from anyone who has experience of using the meter; he is also interested in case studies, especially in relation to planning applications and control.

Consumers and the Environment

The Government is seeking views on how it can work with business to help consumers choose, use and dispose of products sustainably. *Consumer Products and the Environment* sets out the blueprint for an integrated approach to products and the environment, targeted towards the most significant products and issues, and drawing on a range of measures to push forward the market for those products. The paper outlines a number of key proposals including:

- challenges to industry sectors to come forward with initiatives for reducing the impact of the goods they produce;
- options for new environmental labels and awards for the UK domestic market;
- suggestions for industry standards to set minimum levels for products' environmental performance;
- methods to encourage the take-up of the "green claims code" and international standards on product information;
- aims for working with European partners on improving the effectiveness of the European energy labelling and eco-labelling schemes.

The consultation period ends on 23 December. Copies of the consultation paper are available from the DETR, Tel: 0171 890 6575; it is also on the DETR's website:
http://www.environment.detr.gov.uk/

Noise and Health

Noise and Health is a new International Journal which will be publishing peer-reviewed papers on a broad range of topics associated with noise pollution, its control and its detrimental effects; it will cover issues from basic experimental science through clinical evaluation and management, technical aspects of noise reduction systems and solutions to environmental issues relating to social and public health policy; it is aimed at all professions concerned with auditory and non-auditory effects of occupational, environmental and leisure noise.

The first issue, for September - December 1998, includes reports on:

- the contribution of social noise to tinnitus in young people;
- Fatigue after work in noise - an epidemiological survey study and three quasi-experimental field studies;
- Epidemiological studies of the cardiovascular effects of occupational noise.

For more details contact the Editorial Manager, Manjula Patrick at the Noise & Health Editorial Office, Institute of Laryngology & Otology, University College London; Tel: 0171 915 1575/1590.

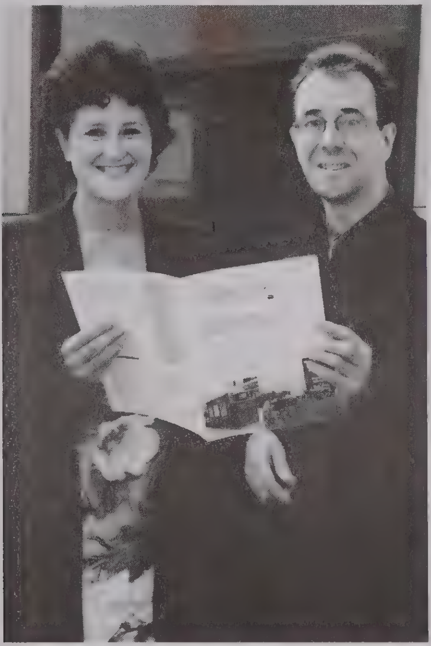
Email: m.patrick@ucl.ac.uk

Website:
http://www.vml.ucl.ac.uk/links/vmlweb/info/research/pan/index.htm

Members News

Members! Are we covering your news? Please check that your press office has Clean Air on its mailing list.

Stanger Science and Environment recently hosted the annual review meeting of automatic air quality networks at the Birmingham NEC. One hundred delegates from local authorities, NETCEN, the Environment Agency and DETR attended the meeting.



Steve Moorcroft, SSE & Trudie McMullen, DETR

Shell UK is to start selling Ultra Low Sulphur Diesel at 140 service stations within the M25 area. Shell has been supplying ULSD to commercial fleets, including urban bus operators, since January 1997. This is the first time it has been made available on forecourts, where it will cost the same as regular diesel.

City of York Council is adding ten dual-fuelled vans to its commercial fleet. The vans can run on unleaded petrol and switch to LPG for inner city driving. The Council has a policy of using only ultra-low sulphur diesel in large vehicles and gas power for suitable light duty vehicles.

A **Tesco** truck and **London Transport** bus fitted with continuously regenerating trap technology developed by **Johnson Matthey** and **Eminox** were two of the vehicles on show at the "Greening the Fleet" seminar organised by **Westminster City Council.** Tesco propose to fit 100 vehicles with CRT in 1998, and it will be fitted as standard to all new trucks in 1999. Pictured below are (l-r) Tim Benstead and Robert Evans of Johnson Matthey, Keith Powell of Tesco, Mike Galey of Eminox, plus David Crowther and David Burke of truck suppliers Scania.

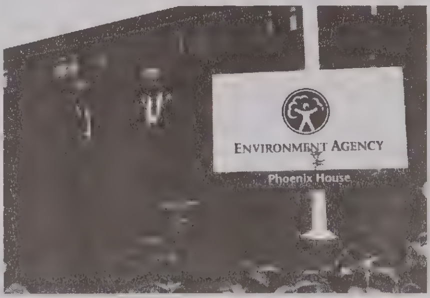
LT bus & Tesco truck on show at the Greening the Fleet seminar

The most comprehensive renewable energy system in Europe - that is the claim for a new power system installed at **De Montfort University.** The hybrid system comprises an anaerobic digester fuelled by pig slurry, a woodchip-powered gasifier, and a wind turbine. All three produce electricity for supply to the mains.

Dundee City Council has won a national environment award for its redeveloped city centre. A major programme of pedestrianisation has been carried out with a view to sustainable development, using local materials wherever possible. Cllr Frank Christie of the city Council, said "Where once there was heavy traffic, noise and fumes there are now cheerful, quiet cobbled street, colourful displays, pavement cafes and public art".

Divisional News

A recent **Yorkshire** Division meeting was held at the new Ridings Area offices of the Environment Agency. Former Chairman of NSCA Council Chairman Cllr Jack Carr was invited to open the building - to be called Phoenix House. He is pictured below with Tony Edwards (left), the Ridings Area Chief Officer.



Former NSCA Chairman, Cllr Jack Carr & Tony Edwards of the Environment Agency

The Society regrets to announce the death, in September, of Frank Haynes after a long battle with lung cancer. Mr Haynes, a former Councillor and MP for Mansfield was instrumental in the effectiveness of smoke control orders in Mansfield. He had been a member of the East Midlands Division for many years and represented it on the National Council of the Society, and was also a member of the Divisional Council; he was also a vice-president of the Society. The Society offers its condolences to Mr Haynes' widow and family.

ENVIRONMENTAL PROTECTION 98

At the Society's AGM held in Weston-super-Mare in October, Sir Crispin Tickell was re-elected as the President of the NSCA for the year 1998-99. The importance of Sir Crispin in the Society's Centenary year, and the excellent work carried out by him in his term as President, was recognised by the meeting.

Sir Crispin Tickell and Mrs Lis Solkhon

The AGM also confirmed Alderman Mrs Lis Solkhon as the new Chairman of the Council of the Society and thanked the outgoing Chairman, Cllr Jack Carr, for his efforts during the year. Other elections included the Honorary Treasurer, Deputy Chairman of Council and Divisional Representatives to Council and the Board of Trustees.

Richard Mills makes a presentation to out-going Chairman, Cllr Jack Carr

Sir Crispin was able to announce to the Society that His Royal Highness the Prince of Wales will be attending the NSCA Centenary Reception in December. The event, which marks exactly 100 years since the inaugural meeting of the Society in Onslow Gardens, London, will focus on the hopes for a sustainable future into the next century. The President said that "attendance by the Prince of Wales is an honour to the Society and illustrates the achievements made in the last 100 years and the contribution which can be made to the next."

The opening address to EP 98 was given by John Gummer MP, the former Secretary of State for the Environment. Mr. Gummer took as his themes the relationships between local action and global problems and the role that NSCA can play in making sure that this relationship gets results.

Rt. Hon John Gummer MP

The Former Secretary of State, known for his active support of the campaign for cleaner air, opened his address by comparing the problems which were faced by the founders of the Society 100 years ago, with the problems of most of the cities of the World, and the population of the world. Global problems are all our responsibilities and without local, and individual action, we can not achieve national and global targets, he said. The issue is one of scale, and each level of responsibility, from the individual to the parish and local councils through to national Government, must be enabled to take all of the action appropriate to its level.

Headline SD Indicators Out Soon

A Government Consultation Paper on "a dozen or so" national headline indicators for sustainable development is due shortly, Brian Leonard of DETR told the NSCA conference. Ministers have yet to decide on the final list, but Mr. Leonard hinted that air quality could be one of the contenders. The Government wants to track progress on a range of economic, social and environmental issues, and the use of indicators, whilst not giving a perfect picture, would be a bold step, he predicted. Under questioning, Mr Leonard acknowledged that the objective of "high and stable levels of growth" specified in the current policy for sustainable development raises difficult questions about the use of GDP as a marker for economic benefits and growth, and suggested that alternative indicators were under consideration.

Bring in the Parking Tax!

Delegates were treated to a rousing call for local fiscal measures to target car use from Prof David Begg of the City of Edinburgh Council. Prof Begg showed how successful measures to limit car access in his city had initially met with opposition, but once implemented the public and, crucially, local traders, became more supportive. Opinion polls showed public support for local road pricing and parking taxes, as long as the revenue went to support local transport schemes, he said. Employers who introduced imaginative green commuting schemes to encourage employees to use less polluting modes of transport should be able to offset the cost of such measures against local car parking charges, he suggested.

Aircraft Responsible for 10% of CO_2?

A draft report from the Intergovernmental Panel on Climate Change is suggesting that aircraft may be responsible for 5-10% of all anthropogenic emissions of carbon dioxide, according to Mark Barrett of consultants Senco. With a 60% reduction in CO_2 emissions required to combat global warming, projections showed that emissions from aircraft are set to rise significantly, unless measures to limit demand are introduced. A half of all emissions are leisure-related, he said, whilst only a small proportion of air freight actually needs to carried by air. Air transport was arguably less of a necessity than other forms of energy use, and should perhaps take a greater share of emissions reductions. A sustainable and equitable personal quota for CO_2 emissions might be around 0.4 tonnes of carbon per year he said. This would be used up on one return flight to New York, he calculated.

No Cardinal Sin!

Most delegates were aware of press coverage of the study of progress on Local Air Pollution Control, carried out by Cardinal Environment. Dr. Christine Hunter of Cardinal Environment was able to put the picture straight with a highly informative presentation on the report, its background and its findings. Local authority enforcement of LAPC has many strengths and these will be built upon by the implementation of the report's recommendation and the follow up action plan, produced by DETR and co-signed by NSCA. In response, Mark Parry of Rotherham MBC, speaking from a local authority perspective, welcomed the findings of the report and the action plan. He detailed some of the ways in which the Yorkshire and Humberside Pollution Advisory Committee was promoting good practice and consistency for the authorisation of "Part B" processes. However, he sounded a warning that, in order for LAPC to be effectively carried out, it must be resourced properly both within authorities and from the Government. The session ended with a suggestion that the Environment Agency and local authorities could work together to resolve some of the enforcement problems they both face and to spread best practice among environmental enforcement agencies.

In the closing session, delegates heard from Prof Ted Evans about recent research on the health effects of entertainment noise, which seems to confirm that long-lasting damage to hearing is likely from exposure to loud pop music. Finally, Environment Minister Alan Meale gave an overview of air quality and noise issues, warmly praising the work which local authorities had undertaken on air quality management, and looking forward to the Review of the National air Quality Strategy.

The EP 98 Delegate Poll only gave a "moderate" rating for governmental environmental progress. However, delegates rated the progress made by local government as even lower, so it's a "could do better" on all fronts. Gordon Brown and ICI came out as the delegate's environmental villains, while John Prescott and the Body Shop were seen as the environmental heroes. Not surprisingly perhaps, the Green Party were awarded the accolade "Best Environmental Political party".

Once again, the Environmental Protection Exhibition drew the top names in environmental products and services. This year's exhibitors included:

> Cambridge Environmental Research Consultants, Casella Ltd, CEL Instruments Ltd, Durag Group, Enviro Techniques Ltd, Enviro Technology Services plc, ETI Group Ltd, ETR Ltd, Greenergy UK Ltd, Horiba Instruments Ltd, Messer UK Ltd, National Physical Laboratory, Shawcity Ltd, Signal Group Ltd, Transoft International Ltd, Transport Research Laboratory Ltd, Turnkey Instruments Ltd, Unicam Chromatography, University of the West of England, Wisepress Ltd.

Exhibition Stands

Environmental Protection 99

Next year, NSCA returns to Brighton for its Annual Conference which will be held from 25 - 28 October. As one of the final events of its Centenary year, NSCA will be welcoming colleagues from the International Union of Air Pollution Prevention and Environmental Protection Associations (IUAPPA) and thus the programme will also reflect wider European and International concerns.

Books & Reports

Air Pollution: Law and Regulation. *D.Hughes, N. Parpworth, J. Upson. Jordans, 1998. £65.00. ISBN 0853084890.*

Written by environmental lawyers, the book looks at air pollution regulation in practice. It covers the development of statutes and regulations, advice on compliance, case law, enforcement and the impact of EC Directives on UK law. The book is current to July 1998.

What Every Manager Needs to Know about Environmental Law. *Pinsett Curtis, Chandos Publishing, 1998 £45.00. ISBN 1902375041.*

The book aims to explore the principal areas where environmental law impinges on industry, landowners and the commercial world. Chapters therefore cover Contaminated Land and Waste Management, IPC and Air Pollution Control, Statutory Nuisance, Packaging Regulations and environmental Assessment. With a clear layout the book aims to make the law accessible.

Waste Management Legal Requirements and Good Practice for Producers of Waste. *Clifford Chance, Chandos Publishing, 1998. £45.00. ISBN 190237505X.*

A guide for managers that aims to clarify the complexities of the waste regulation regime. It aims to steer novices through the legal and regulatory regime, definitions of waste, licensing and liabilities.

Air Pollution and Health, *ed. R.E. Hester, R.M. Harrison, Royal Society of Chemistry, 1998. £22.50. ISBN 0854042458*

Leading figures in the international field of air pollution and health give their views on the current state of knowledge in the field. The volume consists of six papers, covering effects of pollutants and the setting of standards. It is aimed at a general level, as a reference source for both the specialist and the lay reader.

The Car Club Kit. *Brendan Noonan, Steven Cousins. Car Club Publications, 1998. £6.50 (+£1 p&p); available from Car Club Publications, PO Box 1237, Coventry CV6 3B.*

The authors have studied successful car clubs in Europe, particularly in Germany, and produced this guide to seeting up and running a car club - that is shared ownership of one or more vehicles between a group of people. It demonstrates the saviangs that can be made on both the financial and environmental costs of motoring. Shared ownership leads to a reduction in the number of cars on the road and a reduction in mileage. The authors hope that this manual will help to promote shared ownership in the UK.

ISO 14001. *R. Krut, H. Gleckman. Earthscan, 1998. £14.95. ISBN 1 85383 507 2.*

Subtitled "A missed opportunity for sustainable global industrial development", the book is a study of the development of ISO 14001 in the context of the pursuit of sustainable development at national and international level. ISO 14001 is placed in the context of management practices, environmental standards and attempts to improve environmental management in the current deregulatory environment. It is noted that, developed as it was by industry, the standard omits many of the aspirations of sustainable development - notably cross sectoral partnerships, transparency and accountability. The book raises many questions as to the efficacy of ISO 14001 as a tool for sustainable development.

Manual 2000. *J. Elkington, J. Hailes. Hodder & Stoughton, 1998. ISBN 0-340-69679-6.*

A run down on the current environmental betes noires presented in a consumer friendly directory. This manual looks at environmental, social and moral implications of the choices with which we are presented in everyday life, broken down into six areas - food and drink, community and home, transport and travel, communiction and computers, money and investment, and life and death.

Future Events

25-26 JANUARY - 9th Annual Conference: Contaminated Land

The new contaminated land regime - Part IIA of the EPA - is expected to come into force in July 1999; the conference will look at the draft technical, policy and legal guidance which is to be published over the next few months and practical implementation of the new legislation.

Venue: Forte Regents Park Hotel, London.

Details: Catherine Warren, IBC Conferences; Fax: 0171 636 6858; Email: cust.serv@ibcuk.co.uk

16-17 FEBRUARY - Health Effects of Vehicle Emissions

This first international conference will identify and analyse key areas of concern and examine how current legislation, policies and innovation can provide solutions.

Venue: The Royal Society of Medicine, London.

Details: Energy Logistics International Ltd, Fax: 01628 671720; Email: enquiries@energylogistics.co.uk

17 MARCH - VOCs from Batch Processes

One day meeting to consider the difficulties that arise from intermittent emission of VOCs from batch processes including the use of solvents in general manufacturing. Sources and effects of VOCs on the immediate environment will be explored.

Venue: Silsoe Research Institute, Silsoe.

Details: Subject Groups Officer, Institution of Chemical Engineers, Tel: 01788 578214.

23-24 APRIL - Chimney Works 99

Annual conference of the National Association of Chimney Sweeps; programme and exhibition cover all aspects of the chimney industry.

Venue: Swallow Hotel, Peterborough.

Details: NACS Office, Tel. or Fax: 01785 811732.

31 MAY - 2 JUNE - Transport and Air Pollution

8th International symposium organised by Technical University of Graz and Institut National de Recherche sur les Transports et leur Sécurité in cooperation with European Commission. Topics include vehicle emissions and control technologies; traffic related air pollution; pollution dispersion in rural and urban areas; urban air quality modelling; planning.

Venue: Congress Centre, Graz, Austria.

Details: Dr. Peter Sturm, Technical University Graz. Fax: +43 316 46 21 75; Email: sturm@vkmb.tu-graz.ac.at

16-18 JUNE WHO - 3rd Ministerial Conference on Environment & Health

Delegates from more than 51 countries will be discussing and setting the agenda for environment and health for the early years of the 21st century.

Venue: Queen Elizabeth II Conference Centre, London.

Details: Rebecca Lindsey, The Event Organisation Company. Fax: 0171 924 1790; Website: www.event-org.com

8-13 AUGUST - Indoor Air 99

8th international conference on indoor air quality and climate, organised by the International Academy of Indoor Air Sciences in cooperation with the International Society of Indoor Air Quality and Climate. Call for Registration of Interest, Trade Fair Exhibitors & abstracts.

Venue: Edinburgh International Conference Centre.

Details: Mrs Claire Aizlewood, Secretary of Indoor Air 99, BRE, Garston, Watford WD2 7JR. Fax: 01923 664443; Email: ia99@bre.co.uk

8-10 SEPTEMBER - International Symposium on Non-CO_2 Greenhouse Gases

Organised by the European Federation of Clean Air and Environmental Protection Associations, this second international symposium aims to improve scientific understanding, control and implementation measures. Call for papers on: Theme 1: emission inventories, scenarios and scientific understanding of sources, sinks and atmospheric processes; Theme 2: technological options; Theme 3: policy aspects. Abstracts required by 15 January.

Venue: Congress Centre, Noordwijkerhout, The Netherlands.

Details: Dr. Joop van Ham, VVM-CLAN; Fax: +31 15 261 3186; Email: j.vanham@plant.nl; Website: http://milieuonline.nl.vvm

11-14 OCTOBER - International Conference on Atmospheric Dispersion Modelling

6th International Conference on harmonisation within atmospheric dispersion modelling for regulatory purposes; aimed at model developers and model users, and environmental agencies. Abstracts required by 20 February.

Venue: Rouen, France.

Details: Prof. Alexis Coppalle, CNRS - Université & INSA de Rouen; Fax: +33 2 32 95 97 80; Email: Alexis.Coppalle@coria.fr; Website: http://www.coria.fr

25-29 OCTOBER - NSCA Annual Conference and Regional Conference of IUAPPA

NSCA's Centenary celebrations will culminate in Environmental Protection 99 Conference and Exhibition, with a programme reflecting the fact that it is also the occasion for a Regional Conference of the International Union of Air Pollution Prevention and Environmental Protection Associations.

Venue: Brighton, UK.

Details: NSCA; Fax: 01273 735802; Email: admin@nsca.org.uk

FORTHCOMING NSCA EVENTS

Tuesday 16 February 1999
Training Seminar - NEC Birmingham
Local Environmental Management

Thursday 18 and Friday 19 March
Spring Workshop - Abingdon
Air Quality Management - The Next Steps

Thursday 27 May
Workshop - London
UK Dispersion Model Users Group

Thursday 24 June
Training Seminar - NEC Birmingham

Tuesday 14 September
Training Seminar - NEC Birmingham

Monday 25 to Thursday 28 October
Annual Conference and Exhibition - Brighton
Environmental Protection 99

Tuesday 2 November
Training Seminar - NEC Birmingham

Thursday 25 November
Workshop - London
UK Dispersion Model Users Group

Tuesday 15 February 2000
Training Seminar - NEC Birmingham

For further details please contact
National Society for Clean Air and Environmental Protection
136 North Street - Brighton BN1 1RG
Tel: 01273 326313 EMail: admin@nsca.org.uk Fax: 01273 735802

NSCA Spring Workshop

Air Quality Management - the next steps

Thursday 18 and Friday 19 March 1999
Abingdon

The Society's annual workshop on air quality management policy and practice for local authority air pollution specialists. Issues include:

Review of the National Air Quality Strategy
Second and third stage review and assessments
Likely impact of air quality management measures
Public consultation and partnership building
Transport and land-use planning
Economic development, integrated transport and LA21 plans.

For a copy of the brochure please contact NSCA on 01273 326313. The fee for the Workshop, including overnight accommodation on Thursday 18 March and meals is £295.00 + VAT for NSCA members and £355.00 + VAT for non-members.

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The National Society for Clean Air and Environmental Protection produces information, organises conferences and training events, and campaigns on air pollution, noise and environmental protection issues. Founded in 1899, the Society's work on smoke control led to the Clean Air Acts. More recently NSCA has been influential in developing thinking on integrated pollution control, noise legislation, and air quality management.

NSCA's membership is largely made up of organisations with a direct involvement in environmental protection: industry, local authorities, universities and colleges, professional institutions, environmental consultancies and regulatory agencies. Individual membership is also available to environmental specialists within industry, local authorities, central government, technical, academic and institutional bodies.

Members benefit from joining a unique network of individuals who share an interest in a realistic approach to environmental protection policy; from access to up-to-date and relevant information; from reduced fees at NSCA conferences and training events. They contribute to NSCA's regional and national activities; to environmental policy development; to translating policy into practice; to the Society's wide-ranging educational programmes.

NATIONAL SOCIETY FOR CLEAN AIR AND ENVIRONMENTAL PROTECTION

(Founded 1899)

Registered Charity, Number 221026

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Editorial

A New Commitment to Improving Air Quality

The Review of the National Air Quality Strategy, announced by Ministers in January (see Update section), represents a welcome renewal of commitment to improving air quality in the UK. Bringing forward the dates for attaining objectives for some of the less problematic pollutants sends an important message, whilst the decision to relax objectives for particles towards the EU Daughter Directive value reflects our new understanding of the sources and distribution of atmospheric particles.

Research by the Airborne Particles Expert Group, which underpins the policy shift on particles, shows that transboundary pollution is more of a problem than had been recognised hitherto. It also confirms that road traffic is likely to be the predominant source of primary particles in urban areas, especially the very fine particles, which health evidence now suggests may be of most concern.

The implication is that particles will be more difficult to control than had been envisaged when the National Air Quality Strategy was launched two years ago. This means that efforts to tackle air pollution must be redoubled. Within the European Union there is a need to address the precursors of secondary particles - largely emissions of sulphur dioxide and nitrogen oxides - in the context of the Air Quality Framework Directive, and associated work on acidification and industrial pollution control. At UK level Ministers must proceed with measures which will reduce the national burden of particle pollution, for instance fiscal incentives for the use of cleaner fuels. Local authorities will also be able to use this new information to assess the contribution of local sources to particle episodes, and plan control measures accordingly.

Whether the mix of measures now in place will be enough to bring pollution down to acceptable levels within a reasonable timescale, remains open to question. This year's NSCA Spring Workshop will bring together air quality specialists from around the UK to consider the policy implications, and the practical ramifications, of the Strategy Review.

NSCA News & Views

CONSUMER PRODUCTS AND THE ENVIRONMENT

Last October the Government published a consultation paper setting out its view of how Government and business can work together to help consumers choose, use and dispose of products sustainably. The paper sets out a blueprint for an integrated approach to products and the environment, targeted towards the most significant products and issues, and drawing on a range of measures to push forward the market for those products.

In its comments to the DETR, NSCA welcomes the Government's increasing interest in policy measures designed to influence consumers into more sustainable patterns of consumption. NSCA supports the general principles outlined in the consultation paper and in particular the objective of developing an integrated product policy. NSCA made a number of specific comments to the DETR:

Proposals on Policy Development and Coordination

i The Government must make a realistic assessment about whether improved consumer information can actually affect consumption patterns significantly enough to secure measurable improvements in environmental quality. It is desirable to give consumers clear information about the environmental implications of their actions. However the evidence suggests that environmental factors alone are unlikely to influence purchasing decisions made by most consumers for most products and services. Consumer information is not an alternative to regulation, voluntary agreements and the use of fiscal measures, which can more directly influence consumption patterns.

ii The consultation paper fails to identify the mechanism by which Government policy will be developed. An Advisory Panel, meeting occasionally, will scarcely give sufficient impetus to the achievement of policy objectives. There is, therefore, a need for the Government to develop an overall strategy on integrated product policy which starts from the viewpoint of existing environmental objectives and assesses the most appropriate mix of regulatory, fiscal, voluntary and information measures which are likely to contribute most effectively to meeting those objectives. Ownership of the strategy should be held at a senior level within Government in order to ensure that different Departments with an interest in consumer and environmental policy are working in a coordinated way.

iii The consultation paper also fails to identify a potentially important role for local authorities. In practice, many councils already give consumer advice on aspects of environmental protection, whilst local trading standards officers have responsibility for prosecuting false environmental claims. The Government proposes to give local authorities a duty to promote the environmental wellbeing of their localities. This could include an enhanced role in consumer information and the development of initiatives which favour sustainable consumption patterns - for instance the promotion of locally produced food, and other local products and services.

Environmental Information About Products

i There is a danger that environmental labelling can be used to reinforce consumer confidence in consumption - in other words, to encourage the purchase of goods and services by implying that they are positively beneficial to the environment, rather than marginally less damaging than competing products. Any UK labelling scheme should focus on those products which have the greatest potential to reduce environmental impacts.

ii NSCA supports the Government's Green Claims Code, released earlier this year, but believes that it must be backed by tough enforcement. The proposed Advisory Panel on Consumer Products and the Environment should be given a role to "name and shame" companies which abuse the Code. This is potentially a major task, and the Panel will need a secretariat to support its activities. The Panel and its secretariat should be demonstrably independent of Government; it could be established as a Non-Departmental Public Body along the lines of the recently abolished UK Ecolabelling Board.

The consultation period ended on 23 December, and the proposed Advisory Panel is due to be established later this year.

UK DISPERSION MODEL USERS' GROUP

Some seventy members of the Dispersion Model Users' Group attended the eighth workshop held last November at Chadwick Court in Central London, to discuss air quality modelling issues related to road traffic and industrial processes.

The morning session was chaired by Dr Ranjeet Sokhi (University of Hertfordshire) who introduced some of his findings, comparing results from three road traffic models with monitoring data. This work is important as Dr. Sokhi and his team have managed to compile concurrent road traffic flow and ambient air quality data from a number of sites. Installation of traffic flow monitoring equipment is required at other air quality monitoring stations within the urban network to further our understanding of kerbside air quality.

Professor Bernard Fisher (University of Greenwich) then described a series of surrogate statistics based on work undertaken in conjunction with Steve Moorcroft and Dr Yasmin Vawda (Stanger Science). This work suggests that annual mean values of nitrogen dioxide, PM_{10} and suphur dioxide estimated by modelling may be used to determine the likelihood of short term air quality objectives being exceeded (see this issue of *Clean Air*).

This theme for using surrogate statistics was followed by Dr Ian Macrae of the Transport Research Laboratory who described the new revision to the DMRB method for estimating roadside air quality. This method is based on estimating the annual mean concentration of each priority pollutant and applying surrogate statistics in a similar way to those proposed by Bernard Fisher.

Steven Crawshaw and David Tuffery of Bristol City Council then provided an interesting summary of the work undertaken to describe air quality in CUBA (or was that in *Counties that Used to Be known as Avon?*). This presentation provided some insight in to the practicalities of using two commonly used urban scale models: Indic AirViro and ADMS-Urban. An important lesson here was never to underestimate the work required to input data and maintain the emissions inventory.

The final talk of the morning was given by Dr John Stewart of Queen's University Belfast on a rapid screening model of odour assessment. Although still in development, the model has been compared to other models and is considered to give reasonable results when compared to available monitoring data. It is hoped that this model becomes available later this year.

During the lunch, a series of posters were presented by student researchers enabling them to meet professionals in the field of air quality assessment. These posters were coordinated by Linda Davies who can be contacted via the NSCA for students wishing to attend the next meeting.

The afternoon session focused on the debate on which dispersion models are applicable for modelling industrial emissions and was chaired by Richard Chase (Environment Agency). Dr David Carruthers (Cambridge Environmental Research Consultants) provided an overview of how ADMS has developed and described some of the new features in the version 3 model due to be launched this year. Perhaps of most interest to modellers is the ability of ADMS3 to include the effects of both topography and local buildings, as well as reducing the model run time. Dr Carruthers described some of the model validation results, including a comparison of other models such as AERMOD (the USEPA equivalent of ADMS) but stressed the limitations of any dispersion model. Like other dispersion models of similar sophistication, ADMS is considered to be accurate to within a factor of two when modelling the annual mean concentration from a single point source. This factor of error increases to between five to eight or even greater when modelling short term concentrations. ADMS and AERMOD appear to perform reasonably well although the current plume rise and building wake algorithms in ADMS are considered to be mathematically superior. Further revisions to AERMOD next year to include updated algorithms suggests that ADMS and AERMOD should be viewed as technically equivalent models.*

The Agency's contribution to the debate was given by Dr Colin Powlseland who provided a good overview of the role of modelling in regulating industry. Dr Powlseland stated that the Agency *does not impose mandatory dispersion models although the model must be technically appropriate and be of adequate sophistication for the task in hand.* Comments from the floor asked if this message could be passed on to individual Inspectors. It appears that some Inspectors were stipulating one model only. Dr Powlseland reiterated the central office policy of the Agency and stated that his presentation was based on lecture notes given to Inspectors in environmental assessment.

The next talk was given by Mark Broomfield of Aspinwalls who took a step back from modelling and asked, how should we interprete the results? This included a consideration of the various air quality criteria available for the same pollutants (over ten were provided for nitrogen dioxide!) and a call for some guidance. A discussion of the Environment Agency Guidance Note on Environmental Assessment (E1) followed and it was confirmed that this represented current Agency policy.

The final talk was given by Matthew Ireland of Mott MacDonald who first considered the sensitivity of models to emissions data and the range of operating conditions that should be included when modelling an industrial process. The availability of meteorological data was discussed including the licence limitations imposed in the UK. The Met Office are due to review their policy in this in the near future. The conclusion to this talk was a proposal to develop a series of five industrial source modelling scenarios as worked examples of best practice in air quality assessment, including a comparison of different model results.

The Society would like to thank all contributors for making this workshop a success. Copies of presentations are available from the NSCA at a cost of £20.00.

1999 meetings have been arranged for Thursday, 27 May and Thursday, 25 November, both to be held at Chadwick Court. The topic for the May meeting will be urban scale modelling. Those wishing to contribute should contact Matthew Ireland at Mott MacDonald, tel: 01273 365085; Email: mpi@mm-brig.mottmac.com

(Matthew Ireland)

* The Environment Agency has recently commissioned Dr. David Hall (Building Research Establishment) to carry out an independent comparison of UK-ADMS and AERMOD.

Reports

OVERALL UK AIR POLLUTION TRENDS

Greg Archer and Victoria Sykes
WS Atkins Environment

As part of the government's on-going commitment to sustainable development the DETR are presently revising the UK national strategy[1] and supporting indicators. This has included developing proposals for aggregated UK indicators of air pollution concentrations.[2] More recently the DETR have also proposed a small set of 13 Headline Indicators designed to operate as a quality of life barometer[3] measuring everyday concerns. These will be reported regularly through the media alongside the key economic indicators to provide simple measures of sustainable development and to stimulate public interest. One of the issues identified as appropriate for a Headline Indicator is that of air pollution levels.

This paper details the proposed format and methodology for the proposed Headline Air Pollution Indicator (Indicator) and also considers the issues raised regarding overall pollution trends in urban and rural areas. The paper is based upon a report prepared for the DETR by WS Atkins Environment employing data supplied by the National Environmental Technology Centre (NETCEN).[4]

Format and Data for the Indicator

To produce a single air pollution indicator, measured concentrations of different pollutants were combined. This was achieved by employing the DETR's Air Pollution Public Information System[5] to determine the average number of days, at each site, on which the pollution level exceeded the National Standard. The Public Information System includes the five pollutants within the National Air Quality Strategy[6] which can cause acute health effects: carbon monoxide, nitrogen dioxide, ozone, PM_{10} and sulphur dioxide. Other pollutants which cause chronic effects were not included within the Indicator since the Standards for these pollutants have an averaging time of a year whilst those with acute effects are 24-hours or less. There was no robust methodology by which pollutants with both chronic and acute effects could be combined within a single Indicator which could be readily understood by the public.

The Standard Threshold was used since it represents the concentration below which air pollution is unlikely to have *any* health effects. It is also the most robust measure of trends as it is much more widely exceeded throughout the UK than the higher Information or Alert Thresholds. The Indicator measures the average number of days in each year on which concentrations of *any* pollutant were above the Standard. This is consistent with the approach used in the Public Information System and is readily understood.

To ensure the Indicator is robust and representative, only ratified data from the National Automated Monitoring Network were employed. A data inclusion criterion was also developed to determine which sites should contribute to the data-set. This criterion sought to include within the Indicator a large number of sites, with a wide ranging geographical distribution and classification. It also sought to include only sites which produced reliable data and recorded a representative number of days on which pollution was above the Standard. The data inclusion criterion adopted is a compromise between these conflicting requirements. It was not possible to use a statistically representative sample because of the limited number of sites for earlier years, missing data and the lack of a long-term series at some sites.

It is highly desirable that sites contributing data to the Indicator measure all five pollutants. A limited range of pollutants are monitored at most rural, remote, suburban and hotspot sites (those in industrial areas or adjacent to roads). A data inclusion criterion requiring measurements for all five pollutants therefore unacceptably limits the range of sites available to contribute data to the Indicator. Extensive analysis was undertaken to determine which pollutants it was *essential* to monitor to record a *representative* number of polluted days. The criteria adopted were that rural and remote sites should monitor at least ozone; urban and suburban sites must monitor PM_{10}, ozone and sulphur dioxide; and kerbside and roadside sites must monitor PM_{10}.

Further analysis demonstrated that any site which monitored each of these pollutants for more than 50 per cent of the year would identify a representative number of days on which the pollution level was above the Standard. Since 1996, the number of monitoring sites has increased substantially. The data capture achieved by sites was also generally much better than 50 per cent. From 1998 onwards, it is proposed a 75 per cent data capture (consistent with the rate employed in other DETR air quality assessments) is utilised to produce a more robust measure.

Any site which met the data inclusion criterion in a year was included within the Indicator (irrespective of whether it had contributed data in *every* year). This approach did not affect the observed trend but enabled a much wider range of sites to be aggregated. From 1998 onwards, it was proposed to fix the sites included within the Indicator at those meeting the data capture criterion in 1997. This was advisable since future developments of the National Network may lead to the trend becoming skewed. Fixing the sites to be aggregated within the Indicator enables future levels of exceedences to be reliably compared with historic data. It was proposed sites included within the Indicator are reviewed in three to five years to ensure these are still representative and whether the dataset can be reliably expanded.

By aggregating sites in urban areas (including those at Urban Background, Centre, Industrial Suburban, Kerbside and Roadside locations) there are adequate sites to produce a robust aggregate trend from 1993 onwards. For rural (including remote) areas the proposed base-year was 1987. Owing to the different data inclusion criteria, trends and nature of pollution in urban and rural areas, a UK Indicator combining all sites in a single measure was not considered robust.

To stimulate public interest in sustainable development and pollution levels, reporting the Indicator more frequently than annually is preferable. It was however concluded a Bi-annual or Quarterly Indicator was significantly less robust than one produced on an annual basis due to the inter-annual seasonal variation caused by meteorological conditions in different years. There is also a minimum lag of four to five months between the end of the monitoring period and the earliest date the Indicator could be produced. Although it was possible to produce a reasonably robust Indicator on an averaging period of less than a year there is little value in doing this and an overall Annual Indicator is preferred.

UK Overall Air Pollution Trends

Figure 1 illustrates the observed trend in air pollution levels employing the methodology devised for the Indicator. It illustrates the average number of days in each year on which the pollution level was above the Standard. This demonstrated that in urban areas the average number of days above the Standard has declined from 62 in 1993 to 40 days in 1997, this trend is statistically significant at a 95 per cent confidence interval. The improvement has mainly been caused by a reduction in days of sulphur dioxide pollution. In rural areas there has been no significant change in pollution levels. The number of days of pollution above the Standard has varied widely between years and overall rural pollution levels have remained unchanged over the period analysed. In 1997, on average throughout the UK, there were 40 days on which pollution levels were above the Standard in both urban and rural areas, the type of pollution in each area is, however, very different.

The UK National Air Quality Strategy established Objectives for individual pollutants to be achieved by 2005. These allow a small number of exceedences of the Standard for ozone, PM_{10} and sulphur dioxide. It is not possible to relate the Objective for individual pollutants to a permissible number of days on which pollution levels are above the Standard and propose a target for the Indicator. The present Strategy however permits a small number of days on which pollution levels are above the Standard by 2005. It is proposed the DETR give consideration to feasibility of establishing an objective for the Indicator.

The Nature of Pollution Episodes in the UK

Figure 2 illustrates the pollutants responsible for days of Moderate or worse pollution in urban areas. On approximately half of these days the exceedences of the Standard are caused by PM_{10} and a quarter by ozone. On a few days each year PM_{10} and ozone, or PM_{10} and sulphur dioxide are both above their Standards on the same day. It is not clear whether on these days there is a greater health risk to sensitive people. In urban areas, in 1997, there were fewer days of pollution on which two or more pollutants are above the Standard on a single day compared with 1993. In rural areas, most of the days of pollution recorded are caused by ozone only. This was partly as a result of the limited monitoring undertaken for other pollutants in rural areas.

Regional Pollution

It is difficult to draw firm conclusions regarding the regional variation in pollution levels due to the limited number of sites in each region. The data tentatively suggest that for urban areas, London experiences more days of pollution (45) than North West and North East England (43) or the Midlands (33). Scottish urban areas are probably the least polluted in the UK. Belfast still experiences quite high levels of pollution due to the domestic coal burning in the city. In rural areas, Southern England (South East England, South West England and East Anglia) experience the highest number of days of summertime ozone pollution. The lowest number of days occur in Northern Ireland and Scotland. This is illustrated in Figure 3.

High and Very High Pollution Episodes

The Indicator measures the frequency with which pollution levels exceed the Standard Threshold. This represents a level at which mild health effects, unlikely to require action, may start to be experienced by sensitive individuals. On some of these days pollution levels may also exceed the Information Threshold (High Pollution) or Alert Threshold (Very High Pollution). Figures 4 and 5 show the average number of days of Moderate, High and Very High Pollution in urban and rural areas respectively. Days of Very High Pollution, on which significant health effects may be noticed by sensitive individuals, are very infrequent in the UK and declining. In general, sites experienced less than one day of Very High Pollution every two years in urban areas, less in rural areas. Very High Pollution in the UK is now mostly caused by PM_{10} although occasional episodes of sulphur dioxide pollution do occur.

Ranking Sites

The principal objective of the Indicator is to identify trends **not** provide site specific information. The methodology which has been developed could, however, be employed to compare or rank the number of days on which pollution levels were above the National Standard at different sites. The work undertaken for DETR proposed that information relating to individual sites should be excluded from that provided with the Indicator as this does not include all the sites in the network. The data for 1997, which include all sites recording a representative number of days above the Standard do, however, provide an indication of the current frequency of pollution events at different sites.

Figures 6 and 7 show the sites **within the Indicator**, in 1997, with the most and least numbers of days over the Standard for urban and rural areas respectively. It is of questionable validity to compare the number of days of exceedences recorded at urban and rural sites with each other as the latter generally monitor a much more limited range of pollutants. Despite this these sites still record a significant number of days on which pollution levels are above the Standard. The urban site recording the highest number of days above the Standard in 1997 was Port Talbot. Sites in London, Leeds and Belfast also recorded relatively high numbers of episodes. The least polluted urban sites were in Scotland (Edinburgh and Glasgow), Birmingham and Newcastle. The most polluted rural locations were Lullington Heath (which recorded the highest numbers of days of pollution in the UK) and Rochester.

Conclusions

The research has provided further insight into the nature and frequency of air pollution episodes in the UK. It clearly demonstrates that in urban areas pollution levels have significantly improved in the 1990s. In 1997, on average throughout the UK, there were 40 days on which pollution levels were above the National Standard compared to 62 in 1993. This represents a 37 per cent reduction and is statistically significant. The overwhelming majority (91 per cent) of these episodes were Moderate Pollution during which mild health effects start to be experienced by the most sensitive members of society. On approximately half of these days the PM_{10} Standard was exceeded. There are occasional episodes of Very High Pollution, (in 1997, 19 in total) during which widespread and more severe health effects are possible. An increasing, and now overwhelming proportion of these episodes are caused by PM_{10}.

The number of days on which the Standard was breached in rural areas has fluctuated between 40 and 50 days per year since 1987 with no clear trend. Virtually all of these episodes are Moderate Pollution caused by ozone. This is in part due to the very limited range of pollutants monitored at rural sites. The research suggests undetected exceedences of the PM_{10} standard may be widespread in some rural locations. To address this the DETR need to give consideration to expanding monitoring of this pollutant in rural areas which is presently only measured at three sites.

In 1997, in both urban and rural areas, there were an average of 40 days on which pollution levels were above the National Standard. Pollution levels in rural areas are, however, less likely to exceed the Alert Threshold which has the potential for more severe health effects. Targeting of urban pollution hotspots is likely to continue to reduce the frequency of pollution episodes in these areas. In the future, on average, rural areas are therefore likely to experience a higher number of polluted days than urban ones. In 1997 the site recording the highest number of days of pollution was Lullington Health, East Sussex with 77 days. This site does not monitor PM_{10} and therefore would not detect episodes of this pollutant. The Port Talbot (urban site) and Rochester (rural site, which measures PM_{10}) recorded the second highest number of polluted days (72).

Moderate episodes of ozone and PM_{10} are ubiquitous throughout the UK. New requirements for local air quality assessment and management are designed to identify and rectify hotspots of PM_{10} and other pollutants. A UK Ozone Strategy[7] was established in 1993 but recent trends suggest it has not had any significant impact upon either urban or rural concentrations.[2] Forthcoming European legislation and the outcomes from the Second Auto-Oil Programme should complement the present UK strategy and in particular assist in reducing the frequency of transboundary episodes of ozone and PM_{10}. This study has demonstrated considerable progress has been made in improving urban air quality. Further controls upon emissions of primary PM_{10} and precursor pollutants for ozone and secondary PM_{10} are however required to meet the targets for these pollutants.

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The views expressed in this report are solely those of the authors.

Figure 1. Urban and Rural Pollution Trends

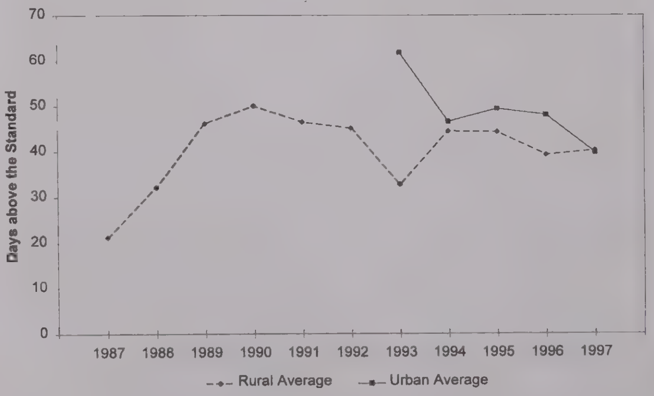


Figure 2. Pollutant(s) causing days on which pollution levels exceed the Standard in urban areas

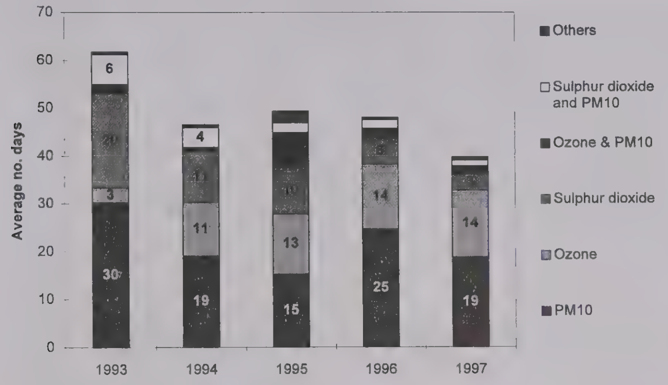


Figure 3. Regional rural pollution 1987-97

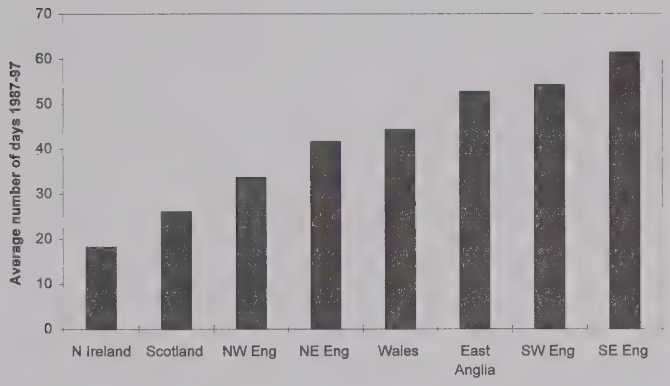


Figure 4. Average number of days of Moderate, High and Very High Pollution: urban areas

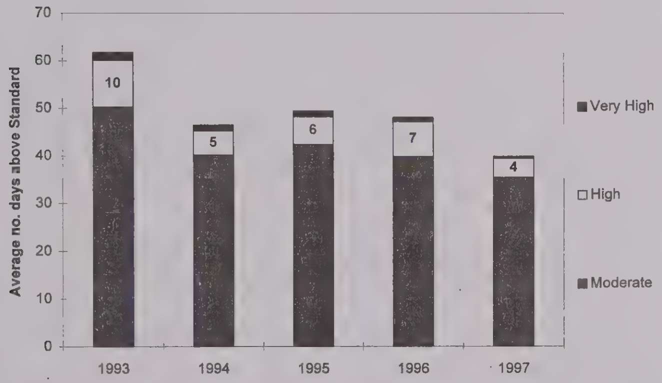


Figure 5. Average number of days of Moderate, High and Very High Pollution: rural areas

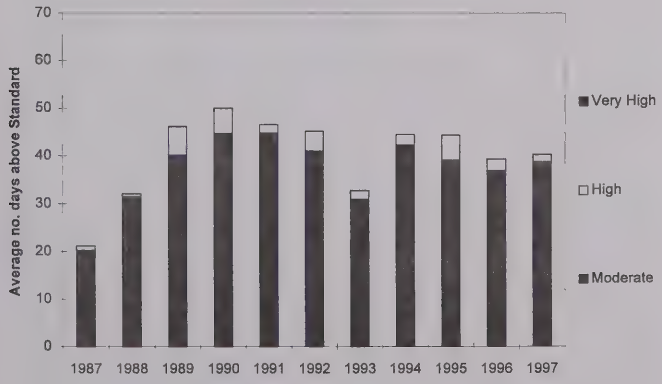


Figure 6. Urban sites with the most and least numbers of days above the Standard included within the Indicator: 1997

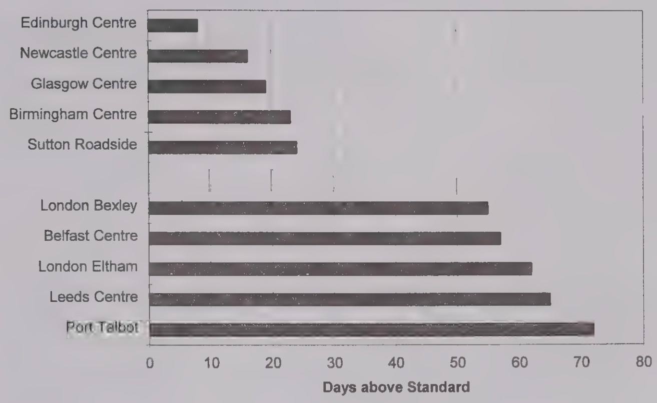
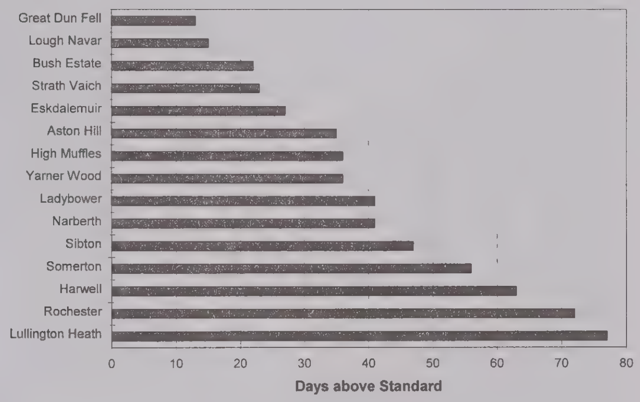


Figure 7. Ranked rural sites included within the Indicator: 1997



Air Quality Dispersion Modelling Issues that Arise During the Review and Assessment Process

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Local authorities have duties to undertake air quality reviews and assessments of their areas under the Environment Act 1995. To discharge these duties local authorities may at some point need to use a numerical estimation scheme or model. This can prompt all kinds of questions regarding the type of dispersion model, the accuracy of results, and the manner in which the results should be interpreted (Middleton, 1997). The Department of the Environment, Transport and the Regions has issued guidance (DETR, 1998) on the selection and use of dispersion models (TG3: Selection and Use of Dispersion Models) but this does not overcome all of the technical problems which frequently arise in assessments. The DETR has established a help line for local authorities from which guidance can be sought (details given below).

This short article reviews the various ways of tackling some of the recurring problems in air quality assessments.

Calculation of Nitrogen Dioxide Concentrations

The standards in the National Air Quality Strategy refer to nitrogen dioxide (NO_2), whereas emissions from most combustion sources are largely in the form of nitric oxide (NO). As the exhaust gases travel downwind, NO is converted to NO_2 by a chemical reaction involving ozone. The rate at which this occurs is dependent on the amount of ozone present, on atmospheric conditions, and on the rate at which a cloud of pollution mixes with the surrounding air. This is therefore a complex process.

There are a number of methods for treating the effect using suitable approximations. In some cases a dispersion model is used to assess NO_X ($NO+NO_2$) and a simple constant conversion factor is applied, e.g. it is assumed that 50% of the NO_X is in the form of NO_2 at the receptor of concern. Sometimes a worst case assumption is adopted and 100% of the NO_X is assumed to be in the form of NO_2. An approach commonly adopted for emissions from isolated stacks is to apply a conversion factor based on measurements (Janssen, van Wakeren, van Duuren and Elshout, 1988) in which the transformation of NO to NO_2 is taken to be a function of time travelled downwind.

(a) Use of Surrogate Statistics to Represent NO_X to NO_2 Conversion

For urban conurbations an average conversion factor has been proposed which relates hourly mean concentrations of NO_X to the hourly mean concentration of NO_2, using a data set collected in Exhibition Road, London (Derwent and Middleton, 1996). The relationship is the one shown in Figure 1. This is one of a number of relationships between NO_X (which can be calculated directly by a dispersion model, but also includes NO_X from urban background sources - see below, Combining Contributions from Different Kinds of Sources) and NO_2 which cannot be calculated in a simple, straightforward way. All the relationships have a somewhat similar flattened S-shape which contains a region over which a change in NO_X produces little change in NO_2. To apply the relationship in a model one needs to calculate NO_X every hour and then apply the relationship to calculate NO_2 every hour.

There are however two reservations with this approach:

- the relationship may not adequately apply to areas outside London. The relationship may be different in other cities. Moreover it could be argued that different relationships should be used for different seasons of the year.
- the relationship may not hold for 2005 as emissions from different sources may change by this time.

Such empirical relationships may therefore be less reliable for future years.

A number of empirical relationships between annual average NO_X and annual average NO_2 have also been proposed and several examples are described in Figure 2. A recent version of the Design Manual for Roads and Bridges contains one such example, labelled "DMRB" in Figure 2, and gives slightly higher annual average NO_2 concentrations than those proposed by Entec (1997), labelled "ENTEC" in Figure 2. Ireland (1998b, see also 1998a) following an analysis of data from all monitoring sites and data in the UK Air Quality Archive has proposed an alternative relationship which gives somewhat higher annual average NO_2 concentrations (labelled "Ireland" in Figure 2). All concentrations are in ppb. Since these three relationships refer to annual mean concentrations, very high hourly NO_X concentrations which are included in Figure 1 are not applicable. When using these relationships, the approach would be to predict annual average NO_X concentrations using the dispersion model adding the urban background concentration, and then to apply the relationship to estimate NO_2.

It should be remembered that Figures 1 and 2 and all the subsequent figures are based on empirical data which is widely scattered around the lines of best fit plotted. A number of equally reasonable alternative relationships may be considered. It may also be argued that there is merit in plotting a curve which represents a likely upper bound to the derived NO_2 concentration rather than the curve that is a best fit to the empirical data. This would be useful if the primary aim is to consider the risk of exceeding an air quality standard.

(b) Use of Photochemical Models to Estimate NO_x to NO_2 Conversion

A number of dispersion models include some type of "photochemical module" which produces direct predictions of the NO_2 concentrations. For example the CALINE4 road traffic model requires the user to input information on background NO_x, NO_2 and ozone concentrations, which it then uses to estimate conversion rates. Some urban models, at the same time as incorporating a complex source distribution, try to describe more accurately the chemical reactions which occur within an urban area, without attempting to be a comprehensive representation of all chemical reactions. The so-called SOMS method (Venkatram, Karamchandani, Pai and Goldstein, 1994) allows a user to estimate the ozone profiles in an urban area and thence the NO_2 concentration. The scheme has been tested against models of the full atmospheric chemistry. It has to be understood that even simple models of atmospheric chemistry with a few reactions require the use of a numerical model in which the urban area is divided into grid squares and the exchange of parcels of air between each grid is simulated by the computer. This is a large computation though one that is becoming more practical on modern desktop machines. Although it is practical to describe the development of a pollution episode over a few days, it is still not possible to describe the daily variation over the course of a year.

Calculating Extreme Statistics

An important issue with the Review and Assessment is the requirement to predict or estimate high percentiles of concentrations as required by the National Air Quality Strategy objectives. For example one needs to determine the highest 1-hour mean NO_2 concentration (effectively the 100th percentile) and the 99th percentile of running 24-h mean PM_{10} concentrations (the concentration which is exceeded on one per cent of occasions). In broad terms the choice is between calculating concentrations sequentially every hour, or every running 24 hours, or a method which uses a surrogate statistic (such as the annual mean) and applies an empirical conversion factor to estimate the peak concentration. A calculation may have already used an empirical conversion factor to convert NO_x concentrations to NO_2 concentrations. For example the recently proposed revision of the DMRB method suggests a way of obtaining the maximum 1-hour NO_2 concentration from the annual average NO_x concentration. This is the curve labelled "DMRB" in Fig 3 which naturally gives much higher concentrations than the annual average NO_x concentrations. An alternative relationship between the NO_2 maximum 1-hour concentration in the year and the NO_x annual mean is that proposed by Entec (1997) labelled "ENTEC" in Fig 3.

Surrogate Statistics for Pollutants Other than NO_2

Relationships between statistical values for other pollutant quantities have also been suggested. Some examples are listed here. The revised DMRB method proposes a conversion factor of three to convert annual average PM_{10} concentrations, including PM_{10} from the road of interest and the local background, to the 99th percentile of running 24-hour mean concentrations. Entec (1997) have also proposed a relationship between annual mean PM_{10} concentrations and the 99th percentile of running 24-hour mean PM_{10} concentrations based on empirical data from the years 1992 to 1996. These relationships are shown in Fig 4.

Moorcroft (1998) has proposed a relationship based on one year of recent monitoring data relating the annual mean PM_{10} and the number of exceedence days which contain a rolling 24-hour mean concentration greater than 50μg m^{-3}. This takes the form:

$$[\text{Number of days} > 50\mu g\ m^{-3}] = 5\ (\text{annual mean } PM_{10} - 18) + 4 \quad (1)$$

This suggests that annual mean concentrations greater than about 18μg m^{-3}, with some variation from year to year, would be associated with an exceedence of the National Air Quality Strategy objective.

The use of surrogate statistics should be undertaken with caution. Empirical relationships vary from year to year according to the weather, and may also in the future as source distributions change. They may not apply at all locations. For example, Entec (1997) propose a relationship between the 99.9th percentile of 15-minute mean SO_2 concentrations and the annual mean SO_2 concentration:

$$[\,99.9\%\text{ile of 15 minute } SO_2] = 13.682\ [\text{annual mean } SO_2\,] \quad (2)$$

where all concentrations are in μg m^{-3}. This relationship may apply at typical locations in the UK, but clearly one would expect the relationship to vary somewhat from place to place depending on the impact of large point emitters with tall stacks. These make a very small impact on annual average concentrations locally compared with diffuse low level emitters, but cause occasional short-term peak concentrations.

Combining Contributions from Different Kinds of Sources

The advantage of considering the annual average first, and then deriving other concentration statistics from it, is that annual average contributions arising from different categories of sources may be added together. Thus for a road in an urban area, the contribution from the road may be added to the urban background concentration (arising from other sources in the urban area), and to the regional background concentration (arising from sources in the rest of the country and abroad). The concentrations from background sources could be derived from another model, such as a regional transport model which produces pollution maps, or from measurements, or from some suitable default value as suggested in the proposed revision of the DMRB.

The annual mean concentration tends not to be strongly affected by episodes of high pollution, though exceptional years containing a large number of pollution episodes will tend to have higher concentrations. In 1996 for example, an exceptional number of episodes of PM_{10} arose from sources outside the UK which had an effect on concentrations in the south-east of the country. If one adopts an approach which involves calculating hourly or 24-hour concentrations in a sequential manner, then for each hour or 24-hour period, one must add to the calculated concentration a background concentration arising from sources outside of the study area. This would be achieved in most practical cases by considering a monitoring site outside the study area, say in the surrounding rural area, and taking concentrations from this site as the measure of the concentration in air coming into the study region. This has the risk of double counting unless care is taken to check on wind direction.

Conclusions

It is not the purpose of this short article to make any recommendation as to which approach to use. All the methods involve some degree of approximation. The choice should be based on what is practical in terms of available data and size of calculation.

The use of models to predict extreme statistics directly has many advantages. The model output results can be directly compared with the air quality objectives, and the method is not reliant on empirical relationships which may vary from one location to another, and from one year to the next. It must however be remembered that all models predict short-term concentrations (such as one hour means) with less accuracy than the annual average. The peak 1-hour concentration in any one year will be highly dependent on the meteorological conditions that are used, which will vary from one year to the next. This can be overcome by using several years sequential meteorological data, but this is both costly, and can result in very long model run times (days or even weeks).

Models can be used to predict annual average concentrations with much greater accuracy. However empirical methods should not be used in conditions beyond those for which the relationship was originally derived. Moreover the empirical relationships do not represent an exact relationship between two statistical quantities. In the data sets on which they are based, there is considerable scatter about the line of best fit.

Each of the approximations discussed has advantages and disadvantages and these are summarised in the table below.

Approximation Procedure	**Advantages**	**Disadvantages**
Constant NO_2:NO_X ratio	Simple to apply Can represent worst case	Somewhat arbitrary Requires justification
Empirical NO to NO_2 conversion rate	Simple to apply	Point sources only Function of travel time
Empirical NO_2:NO_X curve	Simple to apply Can be applied generally	Some justification needed Several choices
SOMS	Built in to some codes Better description of urban ozone	Not proven
Empirical relationship between short-term and annual average concentrations	Simple to apply Contributions from different categories of sources can be added when using annual averages; particularly useful for PM_{10} for which certain categories of emission are uncertain	1-hour peak NO_2 relationship will vary from year to year and with location 99.9 percentile of SO_2 will vary with location
Use of sequential hourly or 15-minute data	All necessary statistics can be derived	Long computation necessary Large meteorological data sets may be required Empirical treatment of background concentrations still required

The debate about simplicity versus complexity is illustrated by the two main issues discussed in this paper. Should one use an empirical function to derive NO_2 concentration from NO_X concentrations or use a photochemical module? When deriving pollution statistics as required by the UK National Air Quality Strategy is it better to use empirical relationships or direct calculations by a model? There is no "right" answer that can be applied. Local authorities undertaking modelling assessments, particularly for Stage 3 assessments, should aim to validate results with actual monitoring data, and may even wish to consider the application of more than one approach to see which gives the better fit.

Local authorities within England and Wales can contact the authors for further advice through the DETR Help line (Telephone 0181 256 4972, or by e-mail at modelhelp@stanger.co.uk).

The views expressed in this paper are personal and do not represent those of the authors' organisations or the DETR.

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Figure 1. Relationship between hourly NO_2 and hourly NO_X proposed by Derwent and Middleton (1996)

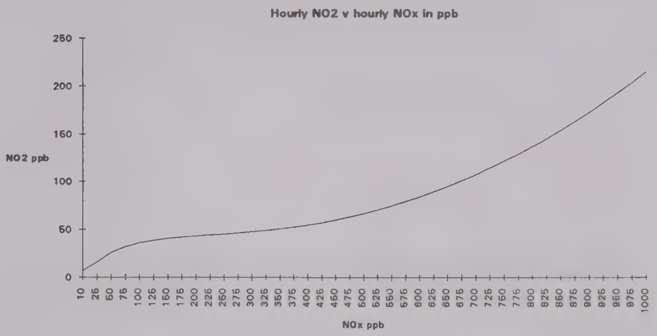


Figure 2. Various proposed relationships between annual average NO_2 and annual average NO_X

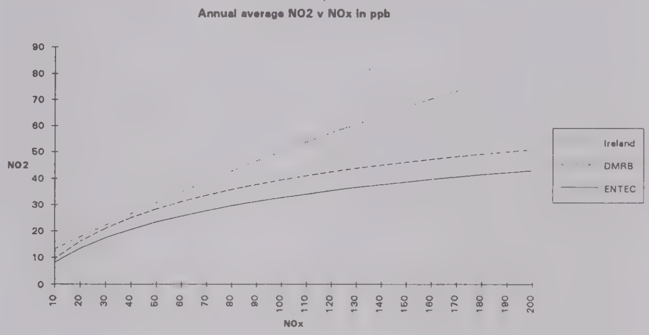


Figure 3. Relationship between annual maximum 1-hour NO_2 concentration and annual average NO_X

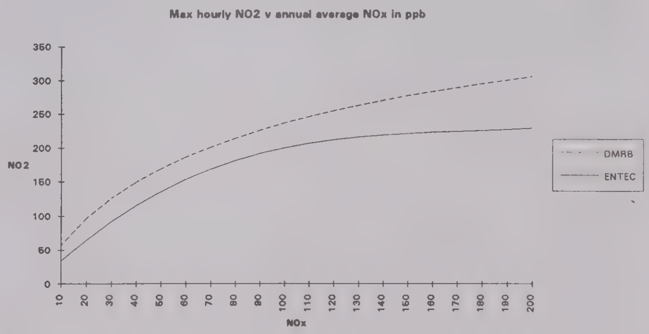
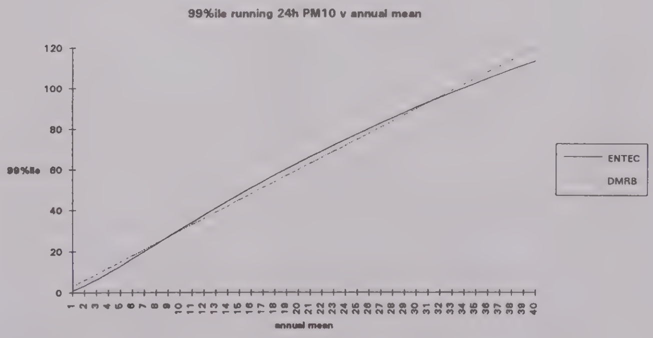


Figure 4. Proposed relationships between 99 percentile of running 24h mean PM_{10} concentrations and the annual mean PM_{10} concentration in $\mu g\ m^{-3}$



Accuracy of Techniques for Modelling the Effects of Building Downwash on the Dispersion of Emissions to Atmosphere

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Ground level concentrations predicted for two industrial processes by two "new generation" computer-based dispersion models (AERMOD and ADMS) and by a commercial CFD model (PANACHE) are compared with wind tunnel measurements. The two processes are a cement works with a stack height of 125 m and a Combined Cycle Gas Turbine (CCGT) power station with a stack height of 60 m. For each process, the site arrangement is kept simple in that only one site building is modelled.

Current versions of ADMS and AERMOD are found to be weak in predicting the effects of buildings on dispersion. CFD is promising but it is as yet unproven for dispersion modelling. We recommend a hybrid approach where the wind tunnel is used to predict dispersion in moderate and strong winds where building, topography and other interaction effects can be significant, and a computer-based conventional model for low winds in stable and unstable weather conditions.

Introduction

Estimates of ground level concentrations of substances released to air are routinely made by air quality consultants, the Environment Agency and local authorities. These estimates are used in planning and Integrated Pollution Control (IPC) applications to determine stack heights and for local air quality reviews.

The effect of an obstacle (such as buildings, topography, and even a stack) on how released substances are dispersed by the wind is complex and usually leads to an increase in maximum ground level concentration. Turbulence and flow re-circulation in the wake behind an obstacle can cause plume material to be mixed rapidly down to ground level whilst the mean streamline deflections caused by the wake can greatly reduce plume height (Reference 1). The height and shape of obstacles, wind speed and wind direction, atmospheric stability, location and height of the release point, and the characteristics of the release can all play a role in determining concentration at a receptor.

The majority of releases to air from stacks will be affected by buildings and topography. Generally, however, the effect of an obstacle will be larger in strong winds because the plume height is lower, turbulent mixing in the wake is more energetic, and the wake under-pressure (and hence the curvature of the mean streamlines) is larger. The maximum ground level concentration of a released substance is usually used for stack height determination and for the assessment of the health and environmental impacts of the release. The effect of buildings and obstacles can cause the maximum ground level concentration to occur in strong wind. It is therefore important that models used for air quality predictions reliably and accurately predict the effects on dispersion of the particular type of buildings and obstacles involved. Of course, the impact of a plume on a hill in stable weather condition, the mixing of plume material down to ground level in convective condition, and the trapping of a plume beneath an inversion layer can all cause the maximum ground level concentration of a released substance to occur at a low wind speed. Therefore, how a dispersion model performs in stable and unstable weather conditions is also important.

In the publication "Released Substances and their Dispersion in the Environment" (Reference 2) the Environment Agency lists the types of models available for estimating the dispersion of substances released to air. At one end there are simple models (such as look-up tables, nomograms, simple formulae, and workbooks) which can be used for preliminary level of assessment. In the middle are intermediate models which are mainly computer-based and are used for routine level of assessment. At the other extreme are complex models, such as computational fluid dynamics (CFD) models and wind tunnel models, which can be used for a specialised level of assessment.

In this paper ground level concentrations predicted for two industrial processes by two intermediate computer-based models and by a commercial CFD model are compared with wind tunnel measurements. Concentrations are predicted for a cement works with stack height of 125 m and for a combined cycle gas turbine (CCGT) power station with stack height of 60 m. For each process, we have deliberately modelled only one site building. The two intermediate computer-based models, namely AERMOD and ADMS, are the so-called "new generation" computer based dispersion models. The CFD model is PANACHE. Even though there is only one site building, current versions of ADMS and AERMOD were found to be weak in predicting the effects of the building on dispersion. CFD is promising but it is as yet an unproven tool for modelling dispersion in the atmosphere. A hybrid approach which combines the strength of the wind tunnel in neutrally stable conditions with an intermediate model in stable and unstable conditions is recommended.

Description of Predictive Models

ADMS and AERMOD

The Environment Agency does not officially prescribe that any particular dispersion model should be used for Integrated Pollution Control (IPC) and stack height determination. The only proviso is that the model be fit for the purpose and based on sound science. In practice, however, preference is given to the "new generation" dispersion models and only two of these (AERMOD and ADMS) are available in the UK. AERMOD has been developed by the US Environmental Protection Agency (US EPA) as a successor to the widely used ISC family of models. The development of ADMS has been funded by a group of sponsors in the UK.

The fundamental science behind both ADMS and AERMOD is similar. They are both steady state models that, in all but unstable atmospheric conditions, assume that the dispersion of emissions in the atmosphere can be characterised by a Gaussian distribution. During unstable conditions both models use a skewed Gaussian distribution to describe dispersion. There are differences in how the two models account for plume rise and the effects of terrain and building downwash. Because of these differences the ground level concentration predicted by ADMS can be significantly different from that of AERMOD.

Neither ADMS nor AERMOD calculate the flow around obstacles. In the current version of ADMS (Version 2.2), the effect of an obstacle on dispersion is extrapolated from measurements made largely in the wind tunnel on idealised simple blocks. Furthermore it is assumed that a group of buildings can be represented by one dominant building. The representation of building effects in the current version of AERMOD (Version 98022) is less advanced than that of ADMS. However, it is understood that a new version of AERMOD will soon be released that will include a more advanced treatment of the effects of obstacles.

Computational Fluid Dynamics (CFD) model

Computational fluid dynamic packages have been developed by a number of companies and essentially solve the relevant science-based mathematical equations for flow including algorithms for calculating concentration, heat and mass flow, phase changes, chemical reactions, mechanical movement and stress. Recently a commercial CFD package has been developed specifically for predicting dispersion of emissions in the atmosphere. This package, fluidyn-PANACHE, has been developed by Transoft International Ltd. Concentrations predicted by using PANACHE (Version 2.2.4) are presented in this paper.

With CFD, the flow around obstacles can be calculated and building effects on dispersion can be directly accounted for.

Wind Tunnel Model

The wind tunnel measurements presented in this paper were made in BMT's Environmental Wind Tunnel. The tunnel is large (working section is 15 m long, 4.8m wide, and 2.4m high) and capable of generating good quality air flow at very low wind speeds.

Wind tunnel modelling requires the construction of a physical model and the simulation of both the wind and the emissions under consideration. If a wind tunnel experiment is carried out with care and the simulation is within certain constraints, then it is widely accepted that this is the most accurate and reliable method for making estimates of the dispersion of atmospheric emissions.

With the wind tunnel, the intricacies of air flow and dispersion, the spectrum of eddies, and, in particular, the effects of obstacles are mimicked, although usually at a smaller geometric scale.

Description of Industrial Processes

The two industrial processes examined in this study are a cement works and a Combined Cycle Gas Turbine (CCGT) power station. The cement works has a 125 m high stack protruding from the top of a 105 m high rectangular building the footprint of which is 25 m by 36 m. The internal diameter of the stack is 4.5 m, the exhaust velocity is 21 m/s, the exhaust temperature is 85°C, and the NO_x emission rate is 167 g/s.

The combined cycle gas turbine power station has a single 60 m high stack which protrudes from the top of a 42 m high building with a footprint of 34 m by 32 m. The internal diameter of the stack is 6.1 m, the stack exhaust velocity is about 23 m/s, the exhaust temperature is 94°C and the NO_x emission rate is 30 g/s.

Wind tunnel measurements were made as part of applications for authorisation under the Environmental Protection Act, 1990. The wind tunnel model was used because of concerns that the intermediate computer-based dispersion models commonly used for air quality assessment are unable to accurately predict the building downwash effects.

Comparison of Measured and Predicted Concentrations

Isolated Stack

In order to assess the significance of building effects on dispersion, some measurements of concentration of the oxides of nitrogen (NO_x) were made with the buildings around the stacks removed. Figure 1 shows isolated stack results for the cement works for an approach wind speed, measured at 10 m height, of 10 m/s. Isolated stack results for the CCGT power station for an approach 10 m high wind speed of 25 m/s are presented in Figure 2. In both figures the maximum ground level concentration measured across the receptor locations examined is plotted against stack height. Also shown in the figures are the ADMS and AERMOD predictions.

The reason for selecting these relatively high wind speeds is that these were found, by both modelling and measurements, to give rise to the highest ground level concentrations when buildings are present. Both the National Air Quality Strategy objective and World Health Organization guideline for nitrogen dioxide (which is one of the oxides of nitrogen) are set in terms of a maximum one hour average so even if a wind speed only occurs for one hour a year, or one hour in every few years, its effects are still of importance for assessing compliance with these air quality standards.

In the case of the cements works (Figure 1), the concentrations predicted by ADMS and AERMOD are practically the same if the stack height is larger than 100 m. For a stack height less than 100 m ADMS predicted larger concentration than AERMOD. The maximum concentration measured in the wind tunnel is lower than both ADMS and AERMOD predictions if the stack height is greater than 75 m. For stack height less than 75 m, the maximum concentration measured in the wind tunnel is lower than ADMS prediction and greater than AERMOD result.

In the case of the CCGT power station, Figure 2 shows that when the approach wind speed is 25 m/s and the stack height is 50 m to 100 m both ADMS and AERMOD under-predict the maximum ground level concentration. This calls for a review of how the computer dispersion models allow for the effects of the stack itself in strong winds.

Effects of Building Downwash

Figures 3 and 4 show the maximum ground level concentration of NO_x measured or predicted when the site buildings were reinstated.

The most significant differences between the models occur at wind directions where a building corner points into the oncoming wind. In this situation, ADMS estimates of maximum ground level concentrations are substantially too large whilst those of AERMOD tend to be slightly too low. In the case of the CCGT power station the maximum ground level concentration predicted by ADMS can be 10 times larger than the value measured in the wind tunnel.

CFD Predictions

Using PANACHE, CFD predictions have been made for the CCGT power station (including the building) for three wind directions. The results are shown in Figure 5. The CFD estimates are slightly lower than, but show the same trend as, the wind tunnel results.

Discussion

The situations examined in this paper are simple in that there is only one site building. Yet the effects of building on dispersion are so complex that they cannot be accurately predicted by conventional PC based dispersion models. However, conventional PC based dispersion models do have an important role to play in assessing impacts from industrial sources. Often, the maximum ground level concentration occurs in low wind unstable (ie convective) conditions where released substances can be mixed rapidly down to the ground level. Furthermore, the impact of a plume on high ground in stable weather condition can also generate elevated ground level concentration. A wind tunnel cannot easily be used to model stable and unstable weather conditions. Therefore we recommend a hybrid approach which combines wind tunnel modelling in moderate and strong winds where building, topography and other interaction effects can be significant, with a conventional computer-based model in stable and unstable weather conditions.

The paper has shown that large errors can be made when conventional computer-based dispersion models are used to predict the dispersion of emissions from a stack in the presence of a building in strong winds. The use of ADMS could lead to the construction of a stack that is considerably higher than necessary whilst the use of AERMOD might underestimate the effects of buildings and hence stack height. CFD modelling has only been carried out for a small number of cases and first results are promising.

The wind tunnel takes proper account of obstacles and topography and is the most reliable method for making detailed predictions of dispersion from stacks in complex conditions. The cost of a simple wind tunnel study can be as little as £10,000. Given that the construction cost of a stack can be as much as £10,000 per metre, a wind tunnel test can significantly reduce overall costs to a developer. When it is cost effective to do so, employing a hybrid approach which combines the strength of the wind tunnel in predicting building effects with the flexibility of an intermediate computer-based model in stable and unstable weather conditions will give increased confidence that the height of the stack is sufficient to ensure that emissions to the atmosphere are rendered harmless at ground level. This increased confidence would allow both the developer and regulator to provide the public with more convincing reassurance that their health will not be affected by a new or existing source of atmospheric pollution. An added benefit maybe the reduced visual intrusion of a lower stack.

Acknowledgment

The CFD modelling presented in this paper was carried out by Transoft International and is gratefully acknowledged.

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Released Substances and their Dispersion in the Environment. Guidance for Applicants for Process Authorisation under Integrated Pollution Control. HSMO Publication 1996. ISBN 0 11 702010 9

Figure 1. Maximum Measured and Predicted Ground Level Concentrations of the Oxides of Nitrogen for Cement Plant Emissions from an Isolated Stack for a Range of Stack Height and Wind Speed of 10 m s^{-1}.

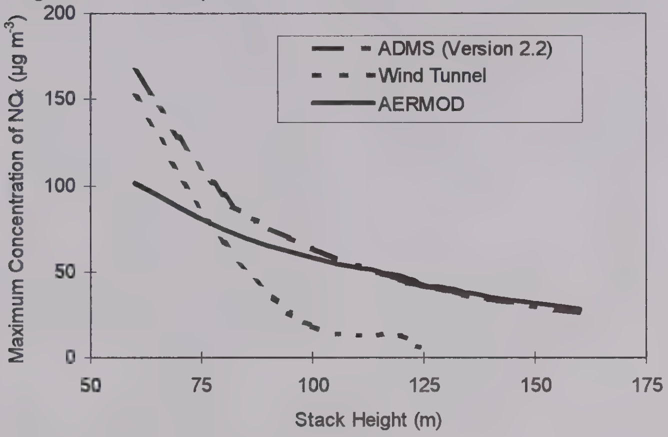


Figure 2. Maximum Measured and Predicted Ground Level Concentrations of the Oxides of Nitrogen for CCGT Power Station Emissions from an Isolated Stack for a Range of Stack Heights and Wind Speed of 25 m s^{-1}

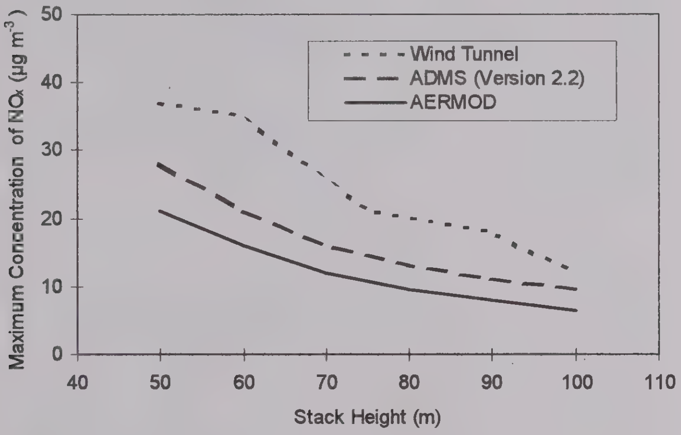


Figure 3. Maximum Measured and Predicted Ground Level Concentrations of the Oxides of Nitrogen for Emissions from an a Cement Works, 125 m Stack, 105 m High Building and Wind Speed of 10 m s^{-1}

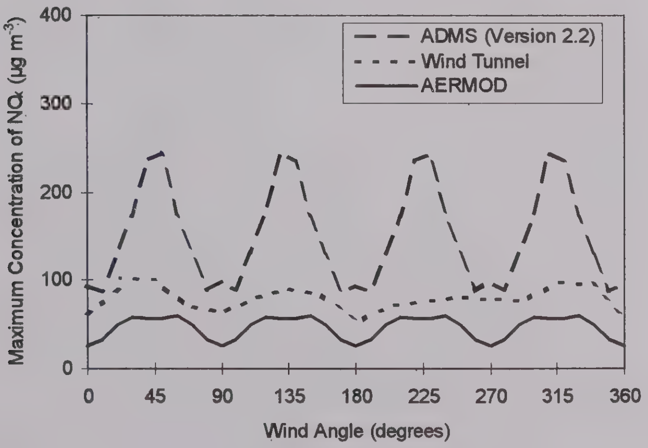


Figure 4. Maximum Measured and Predicted Ground Level Concentrations of the Oxides of Nitrogen for Emissions from a CCGT Power Station, 60 m Stack, 42 m High Building and Wind Speed of 20 m s^{-1}

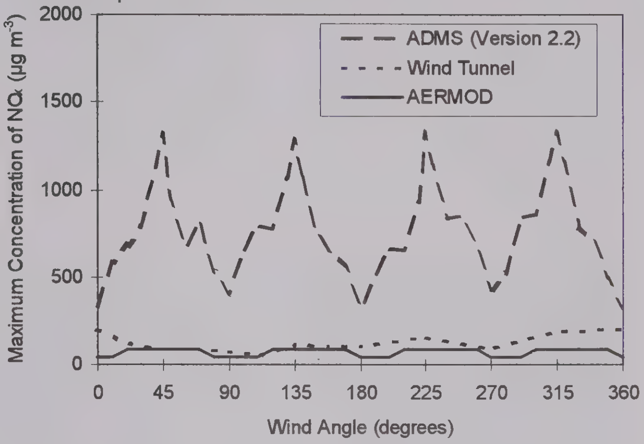
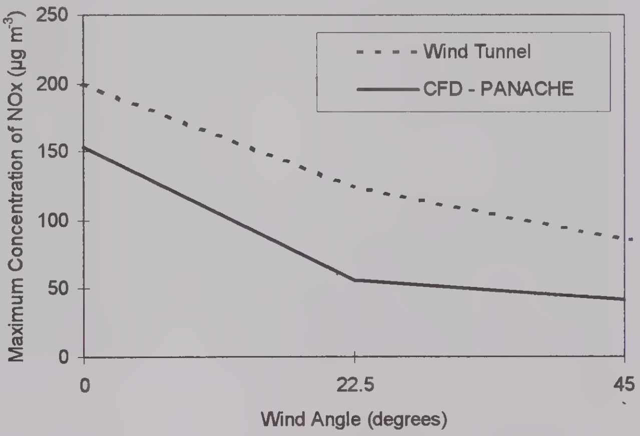


Figure 5. Maximum Measured and Predicted Ground Level Concentrations of the Oxides of Nitrogen for Emissions from a CCGT Power Station, 60 m Stack, 42 m High Building and Wind Speed of 20 m s^{-1}



The Implications of Results from a Local Authority Inter-Laboratory Comparison of NO_2 Measurement by Passive Diffusion Tube

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(3) Royal Environmental Health Institute of Scotland

Four laboratories were contracted independently by the City of Edinburgh Council to prepare and analyse passive diffusion samplers for measurement of nitrogen dioxide (NO_2) during ten 1-week exposures at a kerbside location in Edinburgh. All exposures were performed in triplicate. The results showed significant differences both in the precision and the magnitude of the NO_2 measurement between the laboratories. The median relative standard deviation (RSD) for all triplicate exposures was 12% (n = 40), and the average RSD in mean NO_2 concentration between the four laboratories was 20% (n = 10). Other problems encountered during the inter-comparison are also reported, and the implications of all the findings for local authorities undertaking air quality reviews for NO_2 by this approach are discussed. It is concluded that it appears very important for each local authority to conduct their own replicate and inter-comparison studies. This article is also to be published in the Royal Environmental Health Institute of Scotland's magazine.

Introduction

All local authorities in Great Britain are required under Part IV of the Environment Act 1995 to review and assess air quality in their areas in order to determine those areas which fail to meet the prescribed air quality objectives, as detailed in the Air Quality Regulations 1997. Nitrogen dioxide (NO_2) is one of eight air pollutants to be reviewed and assessed according to the following objectives: 150 ppb (287 $\mu g\ m^{-3}$) or less when expressed as an hourly mean; 21 ppb (40 $\mu g\ m^{-3}$) or less when expressed as an annual mean, to be achieved by the end of the year 2005. Where the objectives are not being met, or are unlikely to be met in the specified time, an Air Quality Management Area should be declared by order.

Passive diffusion tubes are now used by many local authorities for assessing the spatial distribution and long-term trends of NO_2 concentration and for identifying likely pollution "hot-spots". The samplers are relatively cheap and can be used to monitor at many locations for the cost of a single continuous analyser, and are the recommended method for undertaking a Stage 2 review for NO_2 (DETR, 1998).

Although it is established that passive diffusion tubes are a cruder method of NO_2 measurement than the continuous analyser, it is nevertheless important that local authorities have some degree of confidence in their precision and accuracy, particularly if conclusions based on erroneous results lead to an unnecessary waste of resources.

Over the last few years the National Environmental Technology Centre (NETCEN) has instigated Quality Assurance/Quality Control procedures for laboratories analysing diffusion tubes for the UK non-automated NO_2 network. Although there has been notable improvement in inter-laboratory performances, variation is apparent (Bush et al, 1998). The experiences gained from this 10 week laboratory inter-comparison trial in Edinburgh highlight the problems from the perspective of the individual local authority trying to assign confidence to results of their own passive sampler surveys, rather than from the perspective of a nation-wide campaign.

Inter-comparison Details

Four laboratories (A - D) were contracted to supply (by regular mail) and analyse their own NO_2 passive diffusion tubes for ten 1-week exposures between December 1997 and February 1998. Three of the laboratories in the trial participate in the analysis of diffusion tubes for the DETR non-automated NO_2 network and its associated QA/QC programme, and are also NAMAS accredited for the analysis of nitrite.

Each laboratory supplied four tubes for each exposure period; one tube was randomly chosen as an unexposed field blank and the rest exposed as replicates. Care was taken in the trial to minimise any variability that could be attributable to the siting and handling of the tubes by the local authority. All tubes were attached vertically to a single wooden board, in a horizontal line at about 3 cm intervals apart, and 1.5 cm from the back of the board. The board was attached, without sheltering, to the sample inlet cage of the local authority's mobile laboratory, at a height of 2.2 m from the ground. The mobile laboratory was positioned within 5 m of the kerbside of a reasonably busy main road in the city. There were no significant sources of NO_2 other than traffic in the vicinity.

All passive samplers were stored in a fridge (+ 4°C) prior to exposure and before sending exposed tubes back to the appropriate laboratory for analysis. All tubes were analysed within 6 weeks of their preparation.

The laboratories were not aware that they were analysing replicate exposed tubes, or that equivalent exposed samplers were being forwarded to other laboratories.

Procedural Problems

Before discussing the numerical results it is worth highlighting other general problems encountered in this trial, about which it is important for local authorities to be aware when conducting their own surveys.

One laboratory in the Edinburgh trial supplied a batch of prepared tubes in which the plastic caps were not properly sealed to the ends of the tubes. Not only can this lead to contamination and leakage of the adsorbent, but gaps around the cap and/or an increase in the overall effective diffusion length of the tube will lead to erroneous calculation of exposure-average NO_2 concentration. The problem was identified before the tubes were exposed and another batch of tubes was requested from the laboratory.

In another instance, a different laboratory in the trial reported results where exposure duration had been miscalculated from the correct start and finish times supplied by the local authority. The laboratory was asked to re-report its exposure-averaged NO_2 concentrations.

Problems like these, or others associated for example, with tube siting, emphasise the necessity for uniform adherence to guidelines (e.g. the UK Nitrogen Dioxide Survey Instruction Manual) and the considerable vigilance which local authorities must exercise when conducting surveys, even before the stage of interpreting the numerical results obtained.

Precision of NO_2 Measurements

The complete set of replicate and blank NO_2 concentration data supplied by the four laboratories is reported in Table 1. The weekly NO_2 concentrations were not corrected for the associated unexposed field blank. The value of the field blank was a cause for concern in only one of the 40 cases (Laboratory C, Week 8).

The level of precision achieved in the replicate analyses is illustrated in Figure 1 which compares the spread in the distribution of relative standard deviation (RSD) values from each laboratory over the ten exposures of the trial. The RSDs are compared using rank statistics since the distribution of RSDs is non-normal, and so that isolated instances of poor replicate precision from a laboratory do not unduly influence the comparison. Some variability may also arise during sampler deployment and exposure rather than during sampler preparation and analysis.

The overall distribution in the level of precision attained during this inter-comparison must be regarded as fairly poor. The median of all 40 triplicate RSD values is 12.1%. This level of precision equates to a 95% confidence interval about the mean of three replicates of ±30%, i.e. a substantial spread in uncertainty.

However, Figure 1 suggests that the level of precision differs significantly between laboratories, and this is confirmed by a Kruskal-Wallis test. Replicate precision is particularly poor for laboratories C and D for which median values of RSD are 16.4 and 23.0%, respectively, and the upper quartile values greater than 30 and 40%, respectively. In contrast, median RSD values for laboratories A and B are 4.0 and 11.8%, respectively, and upper quartile values less than 14% for both.

Estimate of Accuracy of NO_2 Measurements

All data for each of the ten 1-week exposure periods are summarised in Figure 2. The vertical bars show the maximum, minimum and mean of each triplicate exposure. The mean value is plotted since this is the statistic which would normally be calculated where replicate data are available. The following protocol was used to deal systematically with presumed outliers in the data: an outlier was removed where the RSD of the triplicate values exceeded an arbitrarily chosen value of 50%, and the mean recalculated using the remaining two replicates. Using this criterion, one value each is rejected from laboratory A (week 1), laboratory C (weeks 6 and 8) and laboratory D (week 3).

Visual inspection of Figure 2 indicates that there is widespread variation in NO_2 values for most exposures, and a Friedman analysis of variance comparing the mean values from each laboratory (the central tick marks) confirms there is a significant difference in mean NO_2 values between the laboratories over the 10 exposure periods. Mean NO_2 values from laboratories A and B appear to agree most consistently, and a multiple comparison test confirms that the mean values from laboratories A and D differ significantly ($P < 0.05$) over the course of the 10 exposures.

Discussion

The current QA/QC scheme operated by NETCEN relates only to monthly analysis for nitrite of doped tubes and of a nitrite standard, and does not provide for control checks for preparation of sampler tubes. Experience from this trial suggests that scope remains for improvement in the entire diffusion tube preparation and reporting procedure.

The concentrations reported by the four laboratories involved in this inter-comparison trial of 1-week exposures differed significantly in both the level of precision attained for triplicate exposures and the magnitude of the NO_2 measurement. As there is no reason to suppose that the comparative performance of laboratories in this trial differs particularly from what can be expected for other laboratories across the country, it appears that the level of confidence a local authority can assign to a passive sampler result can depend quite considerably on the laboratory undertaking the analyses.

The recent DETR guidelines for NO_2 measurement by passive diffusion tube (DETR, 1998) quote precision of measurement between 5-8 %, and with tubes tending to overestimate continuous analyser NO_2 on average by about 10%. The median precision uncertainty in the Edinburgh trial was 12%, although the precision between laboratories varied extremely widely. It therefore appears feasible for laboratories to attain average precision levels within the DETR guidelines. Replicate trials should be conducted for individual analytical laboratories. At the same time it is important for local authorities to exercise care in the handling and siting of samplers before, during and after exposure to eliminate other potential sources of variability.

It is also clear in the data reported here that there is considerable variation in measurement accuracy, since there is significant variation between values of laboratory averages for each exposure. It is difficult to assess the magnitude of error associated with accuracy except by comparing the mean values from each laboratory at each exposure period, i.e. comparing the spread in the central tick marks for each week in Figure 2. The RSD value in the four laboratory mean NO_2 concentrations ranges from a minimum of 8.9% in Week 1 (closest agreement in mean values between the four laboratories) to 33.0% in Week 5 (worst agreement in mean values between the four laboratories). The average relative standard deviation in the estimate of NO_2 concentration from the four different laboratories over all ten exposures is 20.4 %. This value corresponds to an average 95% confidence interval about the mean of four laboratory estimates of ± 32%, i.e. a large range of potential uncertainty in true NO_2 concentration. In reality though it is likely that values from laboratories which have a lower spread in replicates are better estimates of the true magnitude of NO_2 concentration. For example, the average RSD between exposure means considering laboratories A and B only is just 7.5%. So again it is important to establish uncertainty estimates specific to a given analytical laboratory.

In principle accuracy can also be assessed by comparison of the diffusion tube values with continuous analyser NO_2 measurements, where available. However, some overestimation of NO_2 by passive samplers might be expected for this kerbside location since recent results have demonstrated that, close to major point sources of nitric oxide (NO), reaction in the tube between NO and O_3 generates significant over-reading of NO_2 (Heal et al, 1999).

Overall, it seems likely that in urban areas, where air quality failures are most likely to occur, the value of $<$ 30% stated as a requirement by the DETR for total uncertainty in NO_2 measurement for the Stage 2 review (DETR, 1998) is likely to be the minimum uncertainty that can be realistically expected from the combination of imprecision and inaccuracy.

The problem for local authorities of uncertainties in measurements is compounded by the fact that in the vast majority of cases passive diffusion tubes are deployed singly rather than in replicate. It is therefore very difficult for a local authority to decide whether or not a particular value might be an outlier and makes it more important still for local authorities to establish, in advance, a reliable estimate of confidence range for their measurements, or measurements supplied to them, by instigating their own form of QA/QC procedures.

Furthermore, although quantitative expressions have been derived in the past for a general relationship that undoubtedly exists between long-term averages measured using passive diffusion tubes and the peak short term concentration during that period (Ireland, 1998), the actual quantitative form of the relationship will certainly vary according to sampler location and hence is likely to be of limited use (or at least subject to wide uncertainty) in assessing compliance with the short-term air quality objective for NO_2.

Conclusions

- Passive diffusion tubes remain a useful screening tool but detailed updated procedural guidance should be provided to local authorities and analytical laboratories for the application of NO_2 passive samplers specifically for the requirements of the air quality reviews.

- It is strongly recommended that each local authority undertake trials of either or both of replicate exposure testing and laboratory inter-comparisons in order to estimate appropriate confidence intervals to apply to their own data from NO_2 passive sampler surveys. This is in accord with subsequent recent guidance from the DETR (1998).

- It is unlikely that values obtained from passive samplers in urban areas can be quoted to better than 30% uncertainty of true concentration of NO_2, particularly at kerbside locations where NO may also be an interference, unless the specific laboratory demonstrates performance within established QA/QC protocols. This uncertainty is the maximum required by the DETR for Stage 2 reviews (DETR, 1998).

References

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Heal M.R, O'Donoghue M.A. and Cape J.N. (1999). Overestimation of urban nitrogen dioxide by passive diffusion tubes: a comparative exposure and model study. Atmospheric Environment 33, 513-524.

Ireland M.P. (1998). Suggested techniques for a second stage air quality review. Clean Air 28, 94-101.

UK nitrogen dioxide survey instruction manual, version 1.1. Produced by AEA Technology on behalf of the Department of the Environment, Transport and the Regions.

Figure 1. Spread in the distribution of laboratory replicate relative standard deviations

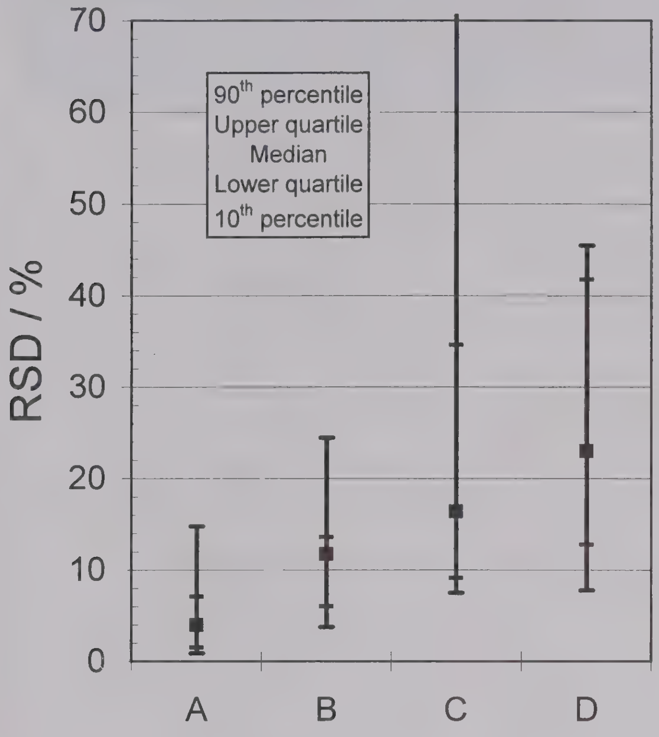

Figure 2. Maximum, mean and minimum of NO_2 triplicate measurement for each laboratory for each 1-week exposure. In four instances replicate data are for two measurements only (see text).

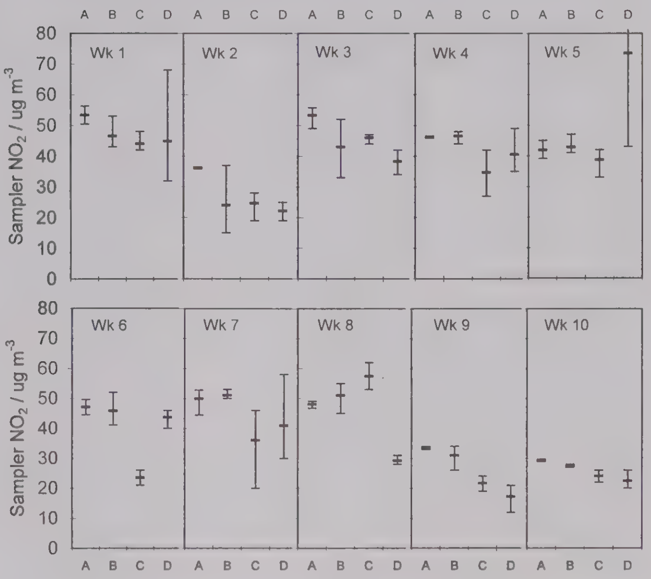

Table 1. Concentrations of NO_2 in µg m^{-3} from laboratories A - D

Lab.	Replicate	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7	Week 8	Week 9	Week 10
A	1	50.4	36.1	55.8	45.8	45.0	49.5	44.4	49.1	32.9	29.4
A	2	11.2	36.5	55.0	45.9	41.4	47.1	52.8	48.3	33.5	29.7
A	3	56.3	35.8	48.9	46.5	39.1	44.5	52.4	46.7	34.0	28.8
A	Blank	0.5	0.5	-	0.7	1.0	0.0	0.3	1.1	1.9	0.4
B	1	53.4	15.3	43.8	43.6	46.5	43.6	52.9	53.8	34.3	26.7
B	2	43.8	20.1	52.0	48.2	40.8	52.3	50.1	44.6	32.7	26.5
B	3	42.6	36.5	33.1	47.7	41.2	41.4	50.3	54.6	26.2	28.3
B	Blank	0.7	1.0	0.8	0.8	0.3	6.0	4.0	6.0	0.5	1.0
C	1	42.0	27.0	47.0	35.0	42.0	21.0	20.0	62.0	22.0	26.0
C	2	48.0	19.0	47.0	27.0	33.0	26.0	46.0	177.0	24.0	22.0
C	3	42.0	28.0	44.0	42.0	41.0	97.0	42.0	53.0	19.0	24.0
C	Blank	1.0	1.0	1.0	5.0	1.0	1.0	2.0	62.0	-	3.0
D	1	68.2	22.5	84.8	34.6	43.3	46.0	58.0	30.8	19.1	25.7
D	2	34.5	24.9	42.4	37.8	107.0	39.5	30.3	28.4	11.9	19.9
D	3	32.1	19.3	34.1	49.1	70.3	45.2	34.5	28.4	20.7	21.6
D	Blank	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8

Update

National Air Quality Strategy Review – The NSCA Guide

On 13 January, the Government published the results of its review of the National Air Quality Strategy (see summary table on next page). The review had originally been scheduled for the end of this year but the incoming Government brought the timetable forward to the end of 1998. The central focus of the review was the air quality standards and objectives for the eight pollutants of concern: benzene, 1,3-butadiene, carbon monoxide, lead, nitrogen dioxide, sulphur dioxide, particulate matter (as PM_{10}) and ozone.

Four main elements informed the review:

- progress made towards the existing objectives;
- the progress which is likely to have been made by 2005 (the deadline for achieving the objectives) following current policy;
- the costs and benefits of achieving the objectives; and
- the Air Quality Daughter Directive Limit values agreed at European level.

The UK is under a legal obligation to assimilate the Daughter Directive Limit Values into UK law. Although values have only been formally agreed for lead, sulphur dioxide, nitrogen dioxide and PM_{10}, with the values for benzene and carbon monoxide existing as proposals at this stage, they effectively form the legal minimum for UK objectives. The modelling work carried out on behalf of the Government, by NETCEN and others, has shown that the UK is in a position to exceed this legal minimum for most of the pollutants, the exceptions being PM_{10} and sulphur dioxide. Even then, the proposals for sulphur dioxide mean that the original objective, which is slightly more rigorous than the limit value, is retained as a firm objective for 2005.

Particulates remain a seemingly intractable problem however, and they have received close attention during this review. The launch of the review coincided with the publication of the report on Source Apportionment of Particulate Matter in the UK by APEG, the Airborne Particles Expert Group set up specifically to look at this issue. The report, and the modelling work carried out, have indicated that the current PM_{10} objective is unachievable; bonfire night alone brings large parts of the UK close to breaching the objective limit of four exceedence days per year. In addition, during times of adverse meteorology, secondary particles transported from continental Europe can cause exceedence in the south east on their own, regardless of any local primary contribution. The objective has therefore been relaxed to that of the Air Quality Daughter Directive Limit Value and the Government has committed itself to working with its European partners to reduce the levels of secondary particles.

What the review did not say was how local authorities should regard the proposed changes during the consultation period or how the new objectives should be incorporated into review and assessment for local air quality management. The fully revised National Air Quality Strategy will probably not be published much before the end of the year, a time when most local authorities will be nearing the end of the second or third stages of review and assessment, using the current objectives. Nor was their any indication as to when the guidance on PM_{10} missing from the Pollutant Specific Guidance document will be forthcoming. The review also recommended that no new powers be given to local authorities to tackle local air quality issues.

The NSCA Air Quality Committee will be considering the review in full and providing a detailed response to the proposals. The deadline for responses is Friday 9th April and copies of the consultation document can be obtained from:

Department of Environment, Transport and the Regions
Eland House
Bressenden Place
London SW1E 5DU
tel. 0171 890 3000

The review document is also available on the Internet, as are some of the supporting technical reports (they will all be available in due course):

- Review document – http://www.environment.detr.gov.uk/airq/consult/naqs/index.htm
- NETCEN technical reports – http://www.aeat.co.uk/netcen/airqual/welcome.html

Any members wishing to contribute to the NSCA response to the review should contact Tim Williamson, the NSCA Policy Officer, at the NSCA offices in Brighton (email – twilliamson@nsca.org.uk).

Particle Pollution

The long awaited report from the Airborne Particles Expert Group (APEG), *Source Apportionment of Airborne Particulate Matter in the United Kingdom*, confirms that airborne particles respect no international boundaries and that the problem cannot be solved by the UK alone, but will continue to need action at European level.

APEG reviewed current knowledge on the levels and sources of particles in the UK; their physical and chemical characteristics, and their long range transport capabilities. The report shows that exceedences of our national health-based particle objective are strongly influenced by sources from continental Europe.

The main findings of the report are that:

- The main sources of particulate matter in the UK are 'primary' particles emitted directly from

National Air Quality Strategy Review: The Proposals

Pollutant	*Current Objectives* (concentration, measured as, deadline)	*Proposed Objectives*	*EU Air Quality Daughter Directive Limit Values*
Benzene	5ppb, annual mean, 31/12/2005	**5ppb, annual mean, 31/12/2003** **1ppb, annual mean, 31/12/2005 (indicative)**	1.6ppb, annual mean, 1/1/2010
1,3-Butadiene	1ppb, annual mean, 31/12/2005	**1ppb, annual mean, 31/12/2003**	
CO	10ppm, running 8 hour mean, 31/12/2005	**10ppm, running 8 hour, 31/12/2003**	8.5ppm, 8 hour mean, 1/1/2005
Lead	0.5µg/m^3, annual mean, 31/12/2005	**0.5µg/m3, annual mean, 31/12/2004** **0.25µg/m3, annual mean, 31/12/2008**	0.5µg/m^3, annual mean, 1/1/2005, or within 1000m of specified industrial sources by 1/1/2010
NO_2	150ppb, 1 hour mean, 31/12/2005	**104.6ppb, 1hour mean, 31/12/2005, 18 EPY (provisional)**	104.6ppb 1 hour mean, 1/1/2010, 18 EPY
	21ppb, annual mean, 31/12/2005	**21ppb, annual mean, 31/12/2005 (provisional)**	21ppb annual mean, 1/1/2010
SO_2	100ppb, 99.9th percentile of 15 minute mean (35 EPY), 31/12/2005	**131ppb, 1 hour mean, 31/12/2004, 18 EPY** **48.6ppb, 24 hour mean, 31/12/2004, 3 EPY** **100ppb, 99.9th percentile of 15 minute mean (35 EPY), 31/12/2005**	131ppb, 1 hour mean, 1/1/2005, 18 EPY 48.6ppb, 24 hour mean, 1/1/2005, 3 EPY
PM_{10}	50µg/m^3, 99th percentile of running 24 hour mean (4 EPY), 31/12/2005	**50µg/m^3, 24 hour mean, 31/12/2004, 35 EPY,** **40µg/m^3, annual mean, 31/12 2004** **50µg/m^3, 99th percentile of running 24 hour mean (4 EPY), 31/12/2005 (indicative)**	50µg/m^3, 24 hour mean, 1/1/2005, 35 EPY, 40µg/m^3, annual mean, 1/1/2005 50µg/m^3, 24 hour mean, 1/1/2010, 7 EPY, 20µg/m^3, annual mean, 1/1/2010 (indicative)
Ozone	50ppb, 97th percentile of running 8 hour mean (10 EPY), 31/12/2005	**50ppb, 97th percentile of running 8 hour mean, 31/12/2005 (indicative)**	

Key: ppm = parts per million; ppb = parts per billion; µg/m3 = micrograms per cubic metre; EPY = exceedences per year (of given time period) vehicle exhausts (and in some areas coal burning and industry); 'secondary' particles (formed by chemical reactions of gases in the air) mainly from the long range transport from Europe and UK power stations; and 'coarse' particles comprised mainly of suspended soils and dusts, together with some sea salt, biological particles and particles from construction work.

- The existing air quality standard for particles (PM_{10}) within the National Air Quality Strategy (50 $\mu g/m^3$ as a 24 hour running mean, to be achieved by the year 2005) will not be achieved with existing policies.
- Bonfire night activities alone will in some years bring PM_{10} concentrations close to exceeding the existing Strategy objective.
- National modelling at urban background sites, based on current policies (excluding the impact of bonfire night or similar festivals) showed widespread exceedence of the existing national particle objective. Exceedences are worst in years characterised by frequent air movements from Europe. Such meteorology can be expected to occur once every five to ten years.
- PM_{10} concentrations in the vicinity of busy roads are higher than those at background locations. Local industrial sources can also impact substantially on PM_{10} concentrations in some areas, as can domestic coal burning where this still takes place.
- National inventories of primary emissions of fine particles ($PM_{2.5}$ and PM_1) and ultra fine particles ($PM_{0.1}$) have been presented for the first time, together with an updated inventory for PM_{10}. These show that the relative importance of road transport increases with decreasing particle size.

The APEG report is available on the DETR internet site (http:/www.environment.detr.gov.uk/airq). It is also available from Ms Lucy Moore, 4f/15 AQ Division, DETR, 123 Victoria Street, London SW1E 6DE; Mrs Sharon Smith, Environment Division, Welsh Office, Cathays Park, Cardiff CF1 3NQ; Paul Spence, AEFD - Environment Protection Unit, The Scottish Office, Area 1H North, Victoria Quay, Edinburgh EH6 QQ; Air and Environment Quality Unit, DOE, Calvert House, 23 Castle Place, Belfast BT1 1FY.

Air Quality Modelling

The Met. Office has published an amended version of Dr. Doug Middleton's 1997 report, *Dispersion Modelling: A Guide for Local Authorities*, ISBN 0 86180 348 5. The Met. Office has also made available on its website its development of the AEOLIUS model, of which a revised version was due to be released at the end of December. Website: meto.gov.uk - see weather services/environment/Aeolius. Research on nomograms for screening air quality in street canyons is to be published in *Atmospheric Environment*.

Emissions Information

The Environment Agency has written to all companies regulated for integrated pollution control advising them that their authorisations are being varied to require them to submit annual reports on releases of over 200 substances specified by the Agency. The first report was due by 31 January for emissions during 1998 with reports covering subsequent years also due on 31 January of the following year.

The new system will cover a wider range of industrial processes than the Chemical Release Inventory, which it will replace, enabling the public to get more information on local and national polluting emissions. An advisory committee, including representatives from industry, environmental pressure groups and government departments, will be set up to advise on the development of the new pollution database.

The new database is to be made available on the Agency's web page www.environment-agency.gov.uk and on its public registers.

Agency Enforcement Policy

The Environment Agency has recently published a new Enforcement and Prosecution Policy, replacing its former enforcement code of practice.

The general principles which the Agency proposes to follow in relation to enforcement and prosecution are:

- *firm but fair regulation*;
- *proportionality* - enforcement action should be proportionate to the risks posed to the environment and the seriousness of any breach of the law;
- *consistency* - is important, but the many variables such as environmental impact, management actions and attitudes and offending history should also be taken into account;
- *transparency* - in why enforcement action has been taken;
- *targeting* - of regulatory effort to those areas which present the greatest risk to the environment.

Circumstances in which the Agency will normally prosecute, so long as it has sufficient evidence, include:

- incidents or breaches with significant consequences for the environment;
- carrying out operations without a relevant licence;
- excessive or persistent breaches of regulatory requirements;
- failure to comply or to comply adequately with formal remedial requirements;
- reckless disregard for management or quality standards;
- failure to supply information without reasonable excuse, or knowingly or recklessly supplying false or misleading information;
- obstruction of Agency staff in carrying out their powers.

Congestion Charging

The Government has published its proposals for dealing with congestion and pollution. *Breaking the Logjam* outlines new powers for local authorities to raise money from road user charging and a workplace parking levy; local authorities would be able to use the revenue so raised on improving local transport.

Following the consultation period, which runs to 31 March, the Government will start work with local authorities interested in taking part in the initial pilot phase to help them draw up charging schemes tailored to local transport objectives. These will then be ready to put into practice once the necessary legislation is passed.

Quality of Life Barometer

The Government is proposing 13 headline indicators for sustainable development designed to measure people's everyday concerns. It is intended that the indicators will help Government, business and local government and individuals to contribute to sustainability, making 'clean growth' a reality. The proposed indicators are:

- *economic growth* - total output of the economy (gross domestic product);
- *social investment* - investment in public assets (transport, hospitals, schools, etc);
- *employment* - people of working age who are in work;
- *health* - expected years of healthy life;
- *education and training* - qualifications at age 19;
- *housing quality* - homes judged unfit to live in;
- *climate change* - emissions of greenhouse gases;
- *air pollution* - days of air pollution;
- *transport* - road traffic;
- *water quality* - rivers of good or fair quality;
- *wildlife* - populations of wild birds;
- *land use* - new homes built on previously developed land;
- *waste* - waste and waste disposal.

Children's Parliament

Children across Britain are to have their say in safeguarding the future of the planet in a new national Children's Parliament on the Environment.

Launched last November by Deputy Prime Minister, John Prescott, and the Education and Employment Secretary, David Blunkett, year 6 pupils (10 and 11 year olds) from across the regions have been challenged to participate in essay and debating competitions which will culminate in a national Children's Parliament in May. The theme of the competitions is sustainable development and winners from each region will lead a debate in the House of Commons Chamber at Granada Studios and be given the chance to "grill" ministers in a Select Committee-style debate at the House of Commons. Around 10 children will present their Action Plan to the Prime Minister in Downing Sreet. Their action plan will be considered in the context of the Government's Sustainable Development Strategy.

NATIONAL
NOISE ACTION DAY

Please note that National Noise Awareness Day has been renamed National Noise Action Day and this year will be on 7 July. We are in the process of preparing publicity material, and will be producing a poster and decibel chart to support promotional work. Further information and a Noise Action Pack will be distributed to all local authorities and interest groups in March/April. If you want to support NAD, have any bright ideas or would like to find out more contact Mary Stevens: email: info@nsca.org.uk.

Members News

Members! Are we covering your news? Please check that your press office has Clean Air on its mailing list.

Thirsty workers at **Ford's** Enfield plant get through 400,000 disposable tea and coffee cups each year. But the cups aren't thrown away - they are recycled into pens, pencils, rulers and ice-scrapers. John Holland, the Facilities Energy Co-ordinator is shown below with bags of shredded cups and some of the resulting money-saving products.

Hackney Council is launching a network of Street Leaders to take responsibility for spotting local environmental threats. The idea is to find a resident in each street who will report problems like dumped refuse, road and path defects, broken streetlights, and so on. Rod Innes of the council said "We've aroused tremendous interest...already we have had almost 100 people sign up."

Sainsbury's second Environmental Report highlights three priorities for the company: reducing waste, carbon dioxide emissions, and the environmental impact of its own brand products. Improvements to delivery systems have eliminated 1.6 million km of lorry trips, whilst energy awareness officers have identified £400,000 worth of energy savings at stores. More than 125 food suppliers have established new habitats on farmland under the Farmland Biodiversity Action Plan, and the company is revising environmental labelling on its products in line with the Government's Green Claims Code.

Neath Port Talbot CBC has successfully prosecuted a local coal processing company for breaches of authorisations under the Environmental Protection Act. Fines against Signal Fern Ltd totalled £6,000 with costs of over £500. Steve Bolchover for the council said "Effective enforcement is part of this council's strategy for air quality management. We are working closely with the community, industry and the Environment Agency to try to improve air quality."

Knowsley MBC has won a special Business and the Environment award for its Knowsley Industrial Park Waste Minimisation Project. This brought together a group of small and medium companies on one industrial estate to adopt waste management practices which will save over £200,000 whilst reducing environmental impact. Delegates to the NSCA Annual Conference heard a presentation on the EU-funded project, which Knowsley now plans to extend to other industrial parks.

Divisional News

East Midlands Division

Fifty-seven members and guests attended the last Divisional meeting (see photo), which was held at the Severn Trent Water visitor centre in Cropston. Presentations on a range of environmental issues relating to water quality were given by Jim Robinson, David Baldwyn, Jo Dempster and John Martin of STW. Members toured the water treatment works.

The meeting noted with sadness the death of Frank Haynes, former Ashfield MP and a stalwart of the East Midlands Divison. Mr Haynes had been a Vice President of NSCA and a prominent campaigner for clean air legislation in Parliament. It was agreed that the Secretary would pass on condolences to Mrs Haynes.

For 1999, East Midlands Divisional meetings have been scheduled as follows: Divisional Council meets on 11 February, 3 June and 7 October. Open meetings will be held on 18 February at Crompton Mill, 24 June (AGM) in Mansfield, and at dates to be confirmed in September and November. A Centenary luncheon will be arranged in April or May.

NSCA Centenary Celebrations

Many Members, including delegates from all the Society's Divisions, attended the Centenary Conference and Reception on 10 December in London. The Conference, held at the Royal Society of Arts, featured speakers including Environment Minster Michael Meacher and DETR Chief Scientist David Fisk. The next edition of Clean Air will include the presentations, together with a number of specially invited papers. HRH The Prince of Wales was principal guest at the Reception, which was held at the Banqueting House. The next NSCA Newsletter will carry a report of the Reception, including the text of the Prince's speech.

The Prince of Wales cuts the centenary cake watched by NSCA President Sir Crispin Tickell

Future Events

17 MARCH - VOCs from Batch Processes

One day meeting to consider the difficulties that arise from intermittent emission of VOCs from batch processes including the use of solvents in general manufacturing. Sources and effects of VOCs on the immediate environment will be explored.

Venue: Silsoe Research Institute, Silsoe, Bedfordshire.

Details: Subject Groups Officer, Institution of Chemical Engineers, Tel: 01788 578214.

23-24 APRIL - Chimney Works 99

Annual conference of the National Association of Chimney Sweeps; programme and exhibition cover all aspects of the chimney industry.

Venue: Swallow Hotel, Peterborough.

Details: NACS Office, Tel. or Fax: 01785 811732.

31 MAY - 2 JUNE - Transport and Air Pollution

8th International symposium organised by Technical University of Graz and Institut National de Recherche sur les Transports et leur Sécurité in cooperation with European Commission. Topics include vehicle emissions and control technologies; traffic related air pollution; pollution dispersion in rural and urban areas; urban air quality modelling; planning.

Venue: Congress Centre, Graz, Austria.

Details: Dr. Peter Sturm, Technical University Graz. Fax: +43 316 46 21 75; Email: sturm@vkmb.tu-graz.ac.at

15 JUNE - HEALTHY PLANET FORUM

Non-governmental event, running in parallel with the Intergovernmental conference (see next entry), providing a valuable opportunity for those attending both conferences to make a contribution to the main conference.

Venue: Westminster Central Hall.

Details: UNED-UK, Tel: 0171 839 7171; Email: 10665.1325@compuserve.com

16-18 JUNE - WHO - 3rd Ministerial Conference on Environment & Health

Delegates from more than 51 countries will be discussing and setting the agenda for environment and health for the early years of the 21st century.

Venue: Queen Elizabeth II Conference Centre, London.

Details: Rebecca Lindsey, The Event Organisation Company. Fax: 0171 924 1790; Website: www.event-org.com

8-13 AUGUST - Indoor Air 99

8th international conference on indoor air quality and climate, organised by the International Academy of Indoor Air Sciences in cooperation with the International Society of Indoor Air Quality and Climate. Call for Registration of Interest, Trade Fair Exhibitors & abstracts.

Venue: Edinburgh International Conference Centre.

Details: Mrs Claire Aizlewood, Secretary of Indoor Air 99, BRE, Garston, Watford WD2 7JR. Fax: 01923 664443; Email: ia99@bre.co.uk

8-10 SEPTEMBER - International Symposium on Non-CO_2 Greenhouse Gases

Organised by the European Federation of Clean Air and Environmental Protection Associations, this second international symposium aims to improve scientific understanding, control and implementation measures. Call for papers on: Theme 1: emission inventories, scenarios and scientific understanding of sources, sinks and atmospheric processes; Theme 2: technological options; Theme 3: policy aspects. Abstracts required by 15 January.

Venue: Congress Centre, Noordwijkerhout, The Netherlands.

Details: Dr. Joop van Ham, VVM-CLAN; Fax: +31 15 261 3186; Email: j.vanham@plant.nl; Website: http://milieuonline.nl.vvm

11-14 OCTOBER - International Conference on Atmospheric Dispersion Modelling

6th International Conference on harmonisation within atmospheric dispersion modelling for regulatory purposes; aimed at model developers and model users, and environmental agencies. Abstracts required by 20 February.

Venue: Rouen, France.

Details: Prof. Alexis Coppalle, CNRS - Université & INSA de Rouen; Fax: +33 2 32 95 97 80; Email: Alexis.Coppalle@coria.fr; Website: http://www.coria.fr

25-29 OCTOBER - NSCA Annual Conference and Regional Conference of IUAPPA

NSCA's Centenary celebrations will culminate in Environmental Protection 99 Conference and Exhibition, with a programme reflecting the fact that it is also the occasion for a Regional Conference of the International Union of Air Pollution Prevention and Environmental Protection Associations.

Venue: Brighton, UK.

Details: NSCA; Fax: 01273 735802; Email: admin@nsca.org.uk

FORTHCOMING NSCA EVENTS

Thursday 18 and Friday 19 March
Spring Workshop - Abingdon
Air Quality Management - The Next Steps

Thursday 27 May
Workshop - London
UK Dispersion Model Users Group

Thursday 24 June
Training Seminar - NEC Birmingham

Tuesday 14 September
Training Seminar - NEC Birmingham

Monday 25 to Thursday 28 October
Annual Conference and Exhibition - Brighton
Environmental Protection 99

Tuesday 2 November
Training Seminar - NEC Birmingham

Thursday 25 November
Workshop - London
UK Dispersion Model Users Group

Tuesday 15 February 2000
Training Seminar - NEC Birmingham

For further details please contact
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clean air
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May / June 1999

the bi-monthly journal of the National Society for Clean Air and Environmental Protection vol.29 no.3

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The National Society for Clean Air and Environmental Protection produces information, organises conferences and training events, and campaigns on air pollution, noise and environmental protection issues. Founded in 1899, the Society's work on smoke control led to the Clean Air Acts. More recently NSCA has been influential in developing thinking on integrated pollution control, noise legislation, and air quality management.

NSCA's membership is largely made up of organisations with a direct involvement in environmental protection: industry, local authorities, universities and colleges, professional institutions, environmental consultancies and regulatory agencies. Individual membership is also available to environmental specialists within industry, local authorities, central government, technical, academic and institutional bodies.

Members benefit from joining a unique network of individuals who share an interest in a realistic approach to environmental protection policy; from access to up-to-date and relevant information; from reduced fees at NSCA conferences and training events. They contribute to NSCA's regional and national activities; to environmental policy development; to translating policy into practice; to the Society's wide-ranging educational programmes.

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Editorial

Celebrating our Centenary 1
Prospects for a Sustainable World

We are now mid-way through the NSCA Centenary Celebrations which this edition of Clean Air and the next record. In this edition we publish the address to the Society by HRH The Prince of Wales; specially commissioned papers on our centenary theme - Prospects for a Sustainable World; and the consultation draft of the Society's own centenary policy declaration.

Launched at our 1998 National Conference in Weston-super-Mare, the Centenary has already provided the springboard for a number of important initiatives, including new educational projects, a sustainable development award for local authorities, and a new series of occasional papers addressing key issues in environmental science and policy. Such initiatives in turn allow us to build on the NSCA's increasing profile to attract and involve more members. NSCA's Divisions are also holding a series of local events to commemorate the founding of the Society.

Perhaps the one event which will stay in the memory was the Centenary Conference and Reception, which took place on 10 December. The Conference was titled Prospects for a Sustainable World - Challenges for Environmental Policy in the Next Millennium. We wanted an opportunity to look beyond our current preoccupations with air quality, noise and local environmental management, to take a broader view of the trends which will set the context for action in the Society's next hundred years.

The presentations took us from a starting point of environmental science, into areas of biological, commercial and cultural sustainability. Some of the main contributions are featured in this special edition of Clean Air, along with some interesting supporting papers. Also included is the speech given by HRH The Prince of Wales at the reception following the conference.

No-one doubts that major changes in attitudes and practice will be needed to set the world on a more sustainable footing. Some of the prospects are frankly depressing, but the day's speakers reinforced a view that it is often small-scale, locally-targeted initiatives which offer the greatest potential for accelerating change. NSCA is a relatively small but influential body with strong local roots, a growing national presence and good international links. As we enter our second century and a new millennium we must consider carefully our priorities for action, so that our efforts can be directed to optimum effect. The papers in this special edition serve as invaluable guidance.

NSCA Centenary Plate

The National Society for Clean Air and Environmental Protection is the world's oldest anti-pollution group. NSCA was founded in Decemeber 1898 as the Coal Smoke Abatement Society, to tackle the pea-souper smogs which afflicted London and other major industrial cities.

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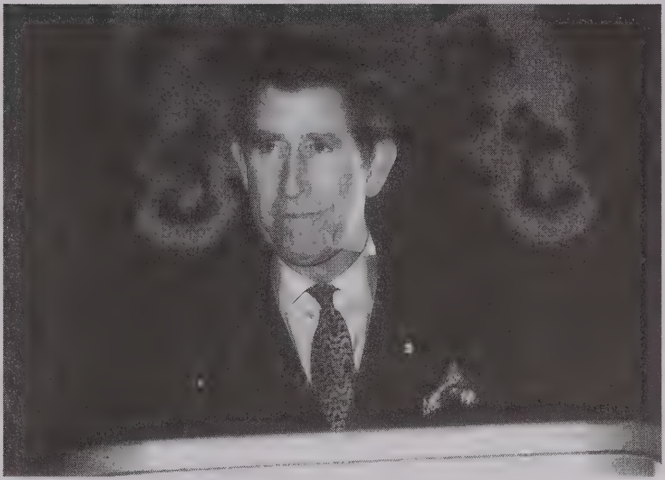
NSCA's Centenary

HRH The Prince of Wales Salutes the NSCA



The Society was honoured to welcome HRH The Prince of Wales to its Centenary Reception held on 10 December 1998 at the Banqueting House, London. In his speech, the Prince of Wales commented on the NSCA's achievements and its continuing role in helping to bring about sustainable development.

"I must confess I feel very hesitant indeed about saying anything this evening knowing that all of you have been closeted in a conference all day, and have heard an awful lot of people speaking - so I can't believe you want to hear somebody else speak to you now. But anyway, I really am delighted to be able to join you here this evening for a very special occasion in the life of the Society, and I do think that it is a sign of the maturity of the environmental movement that there are now significant anniversaries to celebrate.

"I have recently played some part in the anniversary of the International Institute for Environmental Development, which Sir Crispin knows only too well, the 50th anniversary of the Soil Association, and the 70th anniversary of the Council for the Protection of Rural England. But tonight we are here to celebrate the Centenary of a very special organisation indeed - dare I say it, almost the father or mother of all those great names I have mentioned. And it is quite a claim, to be what is widely believed to be the oldest national environmental body working for the control of pollution in the World. So I do congratulate the Society on this occasion.

"I was most intrigued to discover that I share with your Founder the same pastime - it was news to me that Sir William Richmond was moved to set up the Society because he could not see what he wanted to paint for the smog. This is a very good indication, I think, of the powerful emotions which can be aroused by having to stop painting! In my case, it is usually because the paint is actually freezing to the paper, or I have to rush off to yet another engagement - or some photographer with an obscenely long lens appears behind a tree or, on the other hand, I feel sorry for the increasingly impatient policeman pacing about in the local vicinity.

"But whatever the case, the National Society for Clean Air is an example to us all, and it has achieved remarkable successes by bringing people together from different walks of life, by making practical use of innovative techniques, and by working with real determination over very long periods. I particularly admire the Society's ability to look to the future and think in the long term. The problem of smoke in Victorian cities must have seemed as intractable a problem as traffic congestion in our own. But the lesson of your first 100 years is surely that these things can be tackled if we go about them in the right way, and with sufficient determination and stamina.

"I am even old enough to remember London smogs when I was a child, and I also remember every evening having filthy dirty collars to my shirt and filthy dirty cuffs. So now to find that isn't the case is really quite remarkable, but my children have no idea what they're missing!

"So your sustained record of achievement puts you in a strong position, I think, to look at the international aspects of sustainable development. And I hope that your conference earlier today will have produced some interesting ideas. It is obviously a serious concern that the developing world will make some of the same mistakes that the developed world made only a few generations ago. When I hear, for instance, that bicycles are being cleared from some of the streets in China to make more room for cars, my heart sinks. But if anyone can help to address these crucial issues of urbanisation and pollution in the many different parts of the World, let alone this one, I know you can.

"Ladies and gentlemen, this Society can fairly claim to be the trailblazer for all environmental non-governmental organisations. Where you have led, so many others have followed. If I may say so, I think you deserve a wonderful celebration, and I wish you a very happy One Hundredth Birthday, and every possible success for the next 100 years. Many congratulations."

TOWARDS SUSTAINABLE DEVELOPMENT

Rt Hon Michael Meacher MP

Minister for the Environment

Why Sustainable Development?

The last 100 years have been witness to huge technological, social and environmental changes. Most of the changes have been for the better; we have better housing; plentiful and nutritious food; improved transport. In short, living standards have risen. But there has been a price. In the last 20 years alone, world energy use has increased by 60%; demand for wood and fish has risen by 40% - and a world population of 5.9 billion is set to grow to 8.9 billion by 2050.

And yet, not everybody has benefited from rising prosperity and improved technology. Too many people still lack the chance to play their full part in society. Too many people still do not have a decent quality of life. Ensuring a better quality of life for everyone - now and in the future - is at the heart of this Government's policies. Achieving this in a way that does not put undue pressure on the environment and natural resources is the challenge for sustainable development.

We cannot stand still. Conservation is important in itself, but in itself is not enough. We are a dynamic society in an environmentally dynamic world. We need to change, to develop. The key is to develop sustainably, in a way which places due weight on an innovative and efficient economy, social justice, and protection of the environment at one and the same time.

Sustainable development will dominate all agendas of all governments for many years to come. It sits above the almost daily rush of policy announcements and decisions; it is a long term vision, and it is a vision that will require concerted action now if we are to achieve it.

Vision

Our vision is based on four broad objectives:

- social progress that meets the needs of everyone - that means ensuring better health, good education and a reasonable standard of living for everyone;
- effective protection of the environment - ensuring that people's health does not suffer from poor air quality or other pollution, and protecting wildlife and the countryside;
- prudent use of natural resources - ensuring that we use resources efficiently and minimise waste;
- maintenance of high and stable levels of economic growth and employment - so that everyone can share in high living standards and greater job opportunities and to generate the income and wealth needed to pay for essential infrastructure and future investments.

It is the integration of these objectives which will allow us to develop new ways of solving old - and new - problems. It requires a new way of thinking and acting if we truly want to pass on to our children, and their children, a world that can offer a better quality of life.

Strategy

Such an all encompassing vision needs a Strategy to help steer it. We are committed to producing a sustainable development strategy in the UK. This will be a blueprint for action towards achieving sustainable development and will, of course, involve a huge agenda, and one that the Government cannot tackle alone. It requires the understanding, commitment and involvement of all sectors of society.

The *Opportunities for Change* consultation document, which we published earlier in 1998, generated widespread interest with over 1,200 substantive responses from local community groups, environmental groups, academics, businesses and major international companies. In addition we received over 4,500 completed questionnaires from the public. Most responses were generally very positive about our integrated approach. In particular, there was a strong welcome for the inclusion of the social dimension and, unsurprisingly, air quality was a major concern. The final version of our Sustainable Development Strategy is to be published soon.

Indicators

To know whether we are achieving sustainable development, we need to be able to measure progress. Thus we have decided to publish a set of indicators to underpin the Strategy. These will include, where appropriate, targets against which progress can be judged and which will help people to understand what sustainable development is about.

As well as a national set of core indicators, we want to establish a smaller set of "headline" indicators which can be reported regularly in the media. These proposals were launched in a consultation paper *Sustainability Counts*. The headline indicators are intended to be a barometer of life, covering things people care about - such as health, education, housing, employment, economic growth, and the environment. It is, however, important not to see each of these indicators as resting in separate compartments - very often progress on one measure affects what happens in another.

Air Pollution Indicator

For some issues, such as air pollution, we have developed new indicators. Our last public attitudes survey showed that the proportion who were very worried about traffic exhaust fumes and urban smog had risen from under a quarter in 1986 to nearly half in 1996.

The headline indicator shows the average number of days per site when pollution levels are moderate or worse, i.e. above the National Air Quality Standard, which represents the level at which mild health effects occur. For monitoring sites in urban areas the average number of days per site when air pollution was recorded as moderate or worse fell from 62 days in 1993 to 40 days in 1997. This is mainly due to reductions in levels of particulates and sulphur dioxide. In rural areas the average number of days per site has shown no trend and been around 40-50 days per site. We are committed to getting all the indicators moving in the right direction. Action will be required from all sectors of society. It is important that we all pull in the same direction.

Air Quality

Air quality is an issue that neatly encapsulates the integrated nature of sustainable development, touching as it does on

- the need to balance human and environmental health issues against unacceptable economic and social costs;
- the international perspective of transboundary pollution;
- the importance of the widespread participation that will be required to effect change, for example, reducing traffic.

It is, of course, an issue that will feature in the Sustainable Development Strategy.

As you all know, we are reviewing the National Air Quality Strategy, and I would like to take this opportunity to thank the NSCA for its contribution so far, and particularly for its work on the Air Quality Forum. The Review will be completed soon and we will then publish our proposals for public comment, followed by a revised version of the AQ Strategy which will itself be subject to consultation before it is finalised.*

Transport

One area where it is clear that we must do more, if we are to meet our air quality objectives, is road transport - the predominant source of the two pollutants of most concern, particulates and nitrogen dioxide in many of our towns and cities. Increasingly stringent European emission standards for new vehicles continue to deliver considerable reductions in these and other toxic emissions from road transport. But more needs to be done. Our White Paper on the future of transport, *A New Deal for Transport*, contains a radical package of additional measures to reduce traffic emissions and improve air quality - from the use of fiscal measures to encourage cleaner fuels and technology, to the establishment of the Cleaner Vehicles Task Force, a partnership with industry to promote greener vehicles.

But the centrepiece of the White Paper is the introduction of local transport plans. Local authorities will now set out five-year strategies for transport, together with long term targets for improving air quality, road safety and public transport, as well as reducing road traffic. By providing real choice to motorists, through encouraging more walking or cycling and the greater use of public transport, local transport plans should make an important contribution towards improving local air quality. One specific measure which local authorities can undertake as part of their local transport plan to reduce traffic emissions - and which doesn't require new legislation - is to introduce low emission zones, that is zones which restrict access to only the cleanest vehicles in pollution "hotspots". This is an idea which the NSCA has been pursuing with other interested organisations, including some local authorities, and the efforts of the NSCA to promote such zones are very welcome.

Climate Change

One of the biggest sustainable development challenges, on a truly global scale, is the threat posed by manmade climate change. The latest figures from the Hadley Centre indicate that global temperatures will rise by 3 degrees and sea levels by 50 cm by 2100, whilst droughts, floods and storms will become more severe. Not exactly a scenario compatible with our vision of a better quality of life for all.

This is why, on 26 October 1998, the UK became one of the first developed countries to take forward the debate on meeting our new climate change targets when we launched our climate change consultation paper. This sets out options for meeting both our legally binding Kyoto target of a 12.5% cut in greenhouse gas emissions below 1990 levels over the period 2008-2012, and our more ambitious manifesto goal of a 20% cut in carbon dioxide by 2010.

The Kyoto Protocol, agreed in December 1997, showed that there is a global commitment to tackling climate change. But Kyoto also left a lot of unfinished business and this was what we had to address at the recent climate change conference in Buenos Aires. The conference agreed an action plan for the next two years, which will ensure that climate change policy can be put into practice. And it sends a clear signal to business and others that governments are serious about the urgent need to tackle the threats posed by global warning.

Noise

Noise is an issue which is about as far away from the global nature of climate change as you can get; but it is an issue that can seriously impact on quality of life. Noise from transport and heavy industry affects a large proportion of people in this country, particularly in urban areas; and, whilst its effects are rarely life threatening, they can have a considerable detrimental effect on people's quality of life. There is no doubt that it is a complex issue and as such a major challenge. But it is also an example of the kind of linkages that one finds throughout sustainable development - for instance, action to address the air quality associated with transport will often have an implicit noise benefit as well.

The UK is playing an active role in the process of developing the EU's future noise policy which will result in a proposal for a Directive on the assessment and reduction of environmental noise. The proposed Directive would harmonise methods of calculating noise exposure so that targets and action plans can be developed. It will raise the policy profile of noise abatement, stimulate public discussion on future noise policy and encourage cooperation across the Community on the gathering of noise data and information exchange.

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* The Government published its proposals to amend the Strategy on 13 January 1999, and invited comments by 9 April.

Conclusion

Sustainable development is at the heart of Government. We are committed to improving our own performance. But sustainable development cannot be attained by Government alone. It will require the commitment and involvement of all sectors of society. Local authorities, business, NGOs and others all have a role to play; individuals, too, can make a difference. On the environment, this is the message that we are trying to get across in our "Doing Your Bit" campaign - everybody's actions count. Sustainable development affects everyone, it involves everyone, and its success will depend on everyone playing their part, however small. The opportunities to build a modern and fair society for now and for the future are real. We must grasp them. The Sustainable Development Strategy will help us to do just that.

> *This is indeed a special conference. The NSCA is to be congratulated on its commitment and professionalism over the last 100 years in tackling problems of environmental and social concern. Whilst the environmental agenda may well have moved on over the last century, I am delighted that such a prestigious organisation still remains to help us tackle the different yet difficult environmental problems that remain.*
>
> ***Michael Meacher MP***

INDUSTRY, TRADE AND SUSTAINABLE DEVELOPMENT

Björn Stigson
President
World Business Council for Sustainable Development

> *Let me congratulate you on your first 100 years of activity. I admire the vision and foresight of the founders of the National Society for Clean Air and Environmental Protection. Most of us in business have started to address the issues of sustainable development and environment only during the last 10 years, the more visionary perhaps during the last 15-20 years.*

I hope that I will be able to bring a holistic international view to you on the issues and challenges for business which the move towards greater sustainable development is creating. My main message will be that there is a strong shift from the situation only some years ago when the environment and sustainable development were normally seen as risk factors by business, to the situation today and even more tomorrow where they are seen as opportunities - sources of competitive advantage. The progressive companies have understood this and they are grabbing the opportunity.

Are Business and Industry Responding to the Sustainable Development Challenges?

The answer is very clearly yes. In 1992 at the Rio summit the World Business Council for Sustainable Development (WBCSD) presented the book *Changing Course*. This was the first time that international business had formulated its views on sustainable development and it had a fundamental effect on the thought process in Rio and has continued to influence in the years following that. Today *Changing Course* has sold over 200,000 copies and has been translated into 14 languages.

In the six years since Rio business has made great progress towards finding ways of implementing the goal of sustainable development. Last year, five years after Rio, we presented a new report *Signals of Change: Business Progress Towards Sustainable Development*. In this report we have documented a number of "signals of change" - changes in direction and in momentum towards sustainable development. Some signals are stronger than others. Some signals are controversial - they can be interpreted in different ways.

But do the different signals add up to an identifiable change in course? We think that they do signal a paradigm shift in the way in which business does business. It is a shift from a fractured view of environment and development issues to a holistic view of business and sustainable development. More specifically, it is a shift from

- seeing only costs and difficulties in the concept of sustainable development to seeing savings and opportunities;
- end-of-pipe approaches to the use of cleaner, more efficient technology throughout the production system, and further, to seeing sustainable development as integral to business development;
- linear, "through-put" thinking to systems and recycling approaches;
- seeing environment and social issues as responsibilities only for experts to seeing these issues as company-wide responsibilities;
- confidentiality to openness, transparency and discussions with stakeholders.

These shifts are occurring at different speeds in different places, but they are all happening.

What are the Drivers for Business Progress Towards Sustainable Development?

The business response to sustainable development has gone through three phases.

The first one was the "end of pipe" or clean up phase where the main driver for an improved environmental performance was regulation and sometimes embarrassment when things got too bad. "You had to clean up your act because the authorities were forcing you to do so".

The second phase is one that we have entered more recently where it has become clear for many companies that environmental performance makes business sense. The focus in this phase is on improving products and processes to reduce pollution and at the same time improve cost and resource efficiency. A key concept in this phase has been Eco-Efficiency, which is a concept coined by WBCSD before Rio. Eco-Efficiency is about improved Resource Efficiency that can enhance both environmental and financial performance simultaneously. To put it in simple terms: Doing more with less. Last year we produced a book on the subject: *Eco-Efficiency: The Business Link to Sustainable Development* with Livio DeSimone, 3M, and Frank Popoff, Dow Chemical as co-authors. They represent two of the companies that have done most to benefit from the Eco-Efficiency concept.

We have now entered the third phase of the business response to sustainable development. In this phase environmental performance is being integrated into business development and environmental performance becomes a question of the strategic positioning of your company. Companies are realising that they can achieve competitive advantage by improving their environmental performance. To illustrate that let me quote a couple of our members.

Let me start with Ed Woolard, former Chairman of DuPont:

> *"During the next quarter century, the most significant net contribution to a greener world will be made by industry....Not every company is there yet but most are trying. Those that aren't trying won't be a problem simply because they won't be around long term".*

Another key business leader, Percy Barnevik, ABB, said the following:

> *"Environment will represent one of the biggest possibilities for technical and leadership-based innovation - and profitable companies - which the world has ever witnessed".*

Sustainable Development from an Industry Perspective

Several trends suggest that business will pay more and more attention to the sustainable development agenda to remain competitive. These trends are stronger or weaker in various parts of the world and in various business sectors. None taken alone is totally convincing, but taken together it makes a compelling case for a thoughtful chief executive.

But what does Sustainable Development mean? Sustainable Development from an industry perspective is built on three pillars - economic growth, ecological balance and social progress. But, sustainable development is not a clear and easily defined objective. At WBCSD we have, for the past year, been working on a scenario project trying to define Sustainable Development.

There are two parameters that more than others distinguish the scenarios that we have developed from each other:

- ***The uncertainty regarding our ecosystems - how resilient are the ecosystems?***

Our knowledge of this is very limited, and the consequences of this uncertainty means that we cannot judge how much time society has at its disposal to shift towards greater sustainability. Are we close to any critical limits in the ecosystems that could mean sudden stepchanges in the way the world is functioning or are the ecosystems more resilient? Or to put it in simple words: will we turn out to be lucky or unlucky?

The second issue related to the uncertainty is the discounted value in today's money of what happens in the future. The higher the uncertainty, the higher the discount rate and the shorter the time horizon for decisions. With a discount level of 8-10% anything happening more than say 10 years into the future is worth close to zero in today's money unless the future consequences are infinite. If so, the value today is also infinite. But anything short of infinite is worth close to zero today.

If we assume that something will happen 20-30 years into the future - how much can we then afford to invest today to avoid this and who in society is going to pay for the uncertainty which could mean zero return on investment as we calculate today?

- ***Global governance***

The other parameter distinguishing the sustainable development scenarios from each other is global governance. Let me make a couple of observations:

- Six years ago at the Rio Summit, the world was described as bi-polar consisting of Governments and NGOs. Everything that was not a Government was an NGO. Last year when the UN celebrated Rio+5, the world had developed into a tri-polar world made up of Governments, Business and Civil Society. Today the question is how these three poles can interact in a constructive way to manage the sustainable development challenges.
- One of the paradigms that has won the debate during the last 30-40 years, is the paradigm of the Market. Not because the Market is perfect but because it is better than the alternatives in managing a very complex modern society. Central planning in a socialistic economy has shown not to be able to deliver.

So, what kind of future world can we foresee? Will the trend towards the market economy continue and can we make markets function in a more sustainable way or will we see a return to more command and control and big government to handle the sustainable development issues? Will our present international institutions be capable to steer the development in a more sustainable direction? We are not certain that this is the case.

Industry's contribution to sustainable development comes through eco-efficiency. We can be more or less efficient depending on the framework from society. And we also need recognition for our achievements from the financial markets. I will come back to that later.

The Way Ahead - An Enabling Framework From Society

If we want society and business to move towards greater sustainable development it is not sufficient to just look at the internal actions of individual businesses. There is also a need for an enabling framework from society. In Signals of Change we have highlighted some of the key elements of such a framework; they include:

- *Realistic target-setting*
  Targets must be realistic and achievable otherwise they will just disappoint and frustrate everybody when they are not met. Take the CO_2 reduction targets set in Rio six years ago as an example. They were totally unrealistic in the light of the rigid energy infrastructures globally. The coal fired power stations in the world are on average 35 years old and are likely to continue operating for another 20-25 years. To cut CO_2 emissions within 8 years in line with these targets is therefore simply not realistic. The question we now have to ask ourselves is whether the timeframe to fulfill the Kyoto Protocol is sufficient. The targets in the Kyoto Protocol will to a substantial degree have to be met with existing technology as we will not be able to turn over more than a part of the existing capital stock before 2008-2012. It is also questionable if the time available is sufficient to change existing consumption patterns.
- *Fast dissemination of technology*
  The very important role of technology, both innovation and dissemination of new technology, is often not well understood by many parts of society. Technology is still seen by some people as the cause of our environmental problems rather than as a main contribution to higher resource efficiency.
- *Voluntary agreements*
  Voluntary agreements between business and government can be a flexible and cost efficient policy mechanism that supports innovation by business to reach negotiated targets. Several positive examples from many countries are beginning to emerge.

Environmental Performance and Shareholder Value

However, even with an industry being aware of Eco-Efficiency benefits and having an enabling framework by society in place it will still not move business at large towards a more sustainable development with the speed that we would like to see it happen unless we can measure the progress towards sustainable development. This means: How does Eco-Efficiency translate into shareholder value and how are Eco-Efficient companies being recognised by the financial markets. And here we have still a long way to go. Two years ago the WBCSD published *Financing Change* which analysed this topic. Last year we produced another report called *Environmental Performance and Shareholder Value* co-chaired by three of our members DuPont, Swiss Bank Corporation and Storebrand. In this report the working group outlines its main findings on where we are today on this matter; among its findings are that

- Financial markets have up to now generally recognised only negative environmental performance, not seen it as an opportunity;
- The quality of a company's environmental management provides the outside world with a good indicator of the overall quality of its business management.
- The evaluation of environmental factors in the financial marketplace has been hindered by the absence of a financially relevant framework.

To further improve environmental reporting and to educate the financial markets are therefore of crucial importance. Our working group on Eco-Efficiency Metrics and Reporting is addressing this.

The Future Business Agenda

In the future business will have to address a much broader agenda than up to now regarding its role in society. To maintain its "licence to operate" business will have to address issues such as the following:

- **Corporate Social Responsibility**

Where are the border lines for social responsibility between society and corporations? Companies are one of the dominant social institutions of our time with revenues of some exceeding the GDP of many nations. For a number of reasons, the role of companies is changing. In many parts of the world Governments are retreating from their earlier broader role in society and the private sector is being asked to fill the gap. Companies are also facing expectations from local communities, employees and individuals to actively be involved and produce results in areas that were previously the undisputed province of government.

The World Business Council for Sustainable Development is a coalition of some 125 leading international companies that are united by a shared commitment to the environment and to the principles of economic growth and sustainable development. Its members are drawn from 30 countries and more than 20 major industrial sectors and are represented on the Council by their chief executive. Its UK members include BOC, British Gas, BP, ERM, Glaxo Wellcome, ICI, John Laing, NatWest, PowerGen, Severn Trent, Shell and Waste Management International. WBCSD also benefits from a thriving global network of national and regional business councils and partner organizations, with over 700 members in 20 national and regional business councils in developing countries. The WBCSD has been at the forefront of the business response to the challenges arising from the Earth Summit in Rio in June 1992 and has become the pre-eminent business voice on sustainable development issues. Its mission is to provide business leadership as a catalyst for change towards sustainable development and to promote eco-efficiency in business.

The WBCSD is working to define what Corporate Social Responsibility means for our membership. Underlying this initiative is the desire to define the terms of the debate rather than have those terms rest with others outside the companies - and thereby making the agenda highly unpredictable.

- **Sustainability in the Market**

In Rio in 1992 the question of sustainable production and consumption was being discussed. Two years ago we produced a report on the subject *Sustainable Production and Consumption: A Business Perspective.* Business has done a lot to improve production efficiency and we believe that business knows how to tackle the production issues of the future. The consumption side is much more difficult. It involves much more complicated trade-offs in society. It is also a question of who decides what you and I can consume. If you for instance go into a car dealer to buy a car should the car dealer say "No this car is not good for you and society. You cannot buy that. Your transportation needs justify a bicycle only." Or when you go in the supermarket and you want to buy food and someone says "No you shouldn't eat that. Instead you will eat this because it's better for the environment." These issues are fundamental to how we organise our society. Who should play God and decide these issues?

A WBCSD Working Group "Sustainability in the Market" is, via multi-stakeholder dialogues, trying to come to grips with these issues. We held one such dialogue session in Washington in February and another one in September 1998 in Amsterdam. We are planning to produce a report for the UNCSD-7 in April 1999.

- **Climate and Energy**

The challenge of Climate Change is a global matter requiring global solutions. In dealing with this challenge, the issues in the developed world are different from those in the developing world. In the industrialised world the key questions are energy efficiency and a shift to less polluting energy sources. In the developing countries energy is needed for economic growth to eradicate poverty. At the same time the growing energy need must be met with a strategy for technology cooperation that avoids the mistakes made in the early phases of industrialisation in the now industrialised countries.

To meet the challenges of Climate Change new policy instruments like Joint Implementation, Emission Trading, Clean Development Mechanism and Carbon Sinks will be crucial.

- **Sustainable Development Indicators and National Accounts**

It is commonly understood that the standard national accounts are flawed in that a rising gross national product or gross domestic product measures rates of expenditure, and says nothing about the state of the resource base which plays an important part in long-term national prosperity. This is similar to judging an individual's economic worth on what he spends, rather than on the value of his property, equity holdings, salary, and savings. There is much debate on how to change these indicators, and there is also a good deal of agreement that change must come, and in ways that reflect the health of the resource base. To put it in business terms - society needs a balance sheet.

What has been less discussed is the fact that any such change in national accounts will rely heavily on data supplied by business. What natural resources does a company use? In what quantities? To what extent are these resources renewable? It is true that in business "what gets measured gets done". So a change in national accounts could cause a profound change in the ways in which companies measure their resource use. This has to be combined with the need from the companies themselves to find better ways to manage resource efficiency like in our Working Group Eco-Efficiency Metrics and Reporting that I mentioned earlier.

- **Subsidies and Tax Shift**

Related to the preceding issue is the question of subsidies in the world economy. Environmental resources and pollution sinks are often underprized and governments also often subsidise misuse of resources. The World Resources Institute has calculated that the annual subsidies in the world economy amount to 1,000 billion USD annually, primarily to subsidise resource use.

This is a situation that is not likely to continue. The matter of subsidies can be illustrated with the issue of Access to Freshwater. The agricultural sector accounts for 70% of the world's water use, where water often has no or a very limited price. The progress in providing freshwater to the growing megacities in the developing world is also hindered by lack of water pricing that can stimulate investments in new facilities.

Linked to subsidies is the notion of tax shift which is a concept that has been around for some time. It means a shift from taxing societal benefits such as employment to taxing damage to society such as pollution and the waste of resources. Critics have been concerned that governments could be tempted to use such a shift for collecting more revenue. Tax shift has been promoted on the so-called "double dividend" argument that it will be able to both reduce pollution and increase employment. Studies by OECD have not yet been able to confirm the "double dividend" theory.

Conclusions for Business

What are the conclusions of the above for business? Business is making progress towards sustainable development via concepts like Eco-Efficiency. The rate of change in the last six years is impressive. I believe we are just touching the tip of the iceberg of the consequences of the change process that is ongoing and the improvements coming from the innovation in both technology and management practices that are being implemented in companies today. But for business to make faster progress towards sustainable development it needs the right framework conditions from society. It also requires that we can measure our performance and how it translates into shareholder value and that financial markets recognise the importance of the new business concepts. Business cannot address the sustainable development challenges alone. Business needs an active dialogue with other stakeholders in society. The relation between governments, business and civil society and the dialogue that is ongoing today is promising and I am optimistic about the achievements that we are going to see for the next years. Business is listened to and heard in a way that was not the case some years ago. But the agenda that business has to address is growing and getting more complicated. We have also to deal with this growing agenda in an information society where "everyone knows everything about you all the time." There is no place to hide and there is no business as usual. Add to this that we are dealing with emotional issues often requiring technical solutions in a political environment.

So, innovative thinking is needed to address the challenges of the future. To quote Albert Einstein: "Today's problems cannot be solved by thinking the way we thought when we created them".

SMALL IS BEAUTIFUL, BIG IS SUBSIDISED

Helena Norberg-Hodge

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This article introduces the ISEC's October 1998 discussion paper Small is Beautiful, Big is Subsidised: How our taxes contribute to social and environmental breakdown, *whose principal author is Steven Gorelick. The ISEC is concerned with the impact of economic development on society and the environment. It promotes human-scale economics through a wide range of programmes on three continents - from "counter development" in the Himalayas and community action groups to discussion papers.*

With the demise of communism, it is generally assumed that the world has only one option: an unregulated global market dominated by giant corporations.

Many people believe that deregulation frees large, transnational corporations to provide consumers with an unprecedented variety of produce from every corner of the globe. Thanks to the global economy, we are able to fill our shopping baskets with apples from Kenya, cheap butter from New Zealand and a whole range of exotic foods. If this produce is cheaper than locally-produced alternatives, then that is because suppliers are operating on a larger, more efficient scale. Sophisticated PR and advertising campaigns persuade us that the bigger the company, the safer the food.

In addition to these consumer benefits at home, many people seem to think that the spread of Western-style economic development will be accompanied by Western-style democracy abroad. Globalisation has brought about cheap air travel and closer communication between diverse cultures, and it is hoped that this will herald the emergence of a peaceful 'global village' and eliminate warring strife between nations.

Similarly, because environmental crises - from climate change to species depletion - clearly transcend national boundaries, globalisation is also seen as a necessary step towards international collaboration to solve global problems.

Beyond these supposed beneficial effects, the global economy is declared inevitable - it will continue to grow whether we like it or not. It's the consequence of an insatiable consumer culture. It's what giant corporations want, or more to the point, it's what no one has the power to stop. In the final analysis, globalisation is often portrayed as a kind of economic 'manifest destiny' dictated by 'economic laws' beyond the reach of human intervention. These laws are said to naturally favour large producers over small, centralised global production over dispersed local production. Big, it turns out, is cheap; big is efficient, big is better! However, the truth of the matter is that 'efficiencies of scale' are a myth: big is not necessarily 'cheaper' or more 'efficient'.

If we allow ourselves to look beyond the assumptions and narrow confines of this conventional wisdom, it becomes clear that giant corporations are the product of government support through a range of both direct and indirect subsidies.

Tilting the Playing Field

For generations now our tax money has been used to create an economic framework that favours the big over the small. The result is that all of our choices - from education, energy use, transport and communications - are being shaped and distorted to suit an ever more centralised, ever more globalised economy. Combined, these costly subsidies and investments make for an extremely inefficient system. Any appearance of efficiency is maintained only because our taxes cover many of the costs at the expense of small, local producers who, left to their own resources, are thereby made to seem comparatively inefficient.

Large TNCs (transnational corporations) also benefit from their ability to pressurise governments into passing regulations favouring large producers often in the deliberate attempt to destroy smaller competitors. An additional factor which paradoxically ends up favouring large over small is the fact that large scale, intensive production is often inherently polluting.

Consider the case of factory farming. Where large numbers of animals are made to live in close confinement, conditions are ripe for the outbreak of virulent disease. In this situation, more controls and regulations are required than is the case for smaller producers. The latter, however, are forced to comply with these same stringent - and, for them, unnecessary - safeguards, at a cost that few can afford to bear.

Government support for transport and high-tech communications make it possible for multinational corporations to destroy smaller local competitors. A local shop in a village in England that buys most of its goods locally, does not need satellites, mainframe computers, large-scale transport infrastructures, container ships, heavily subsidised airplane fuel, and so on. In contrast, a large hypermarket could not exist without them.

From the point of view of the consumer, it can look as though goods from the other side of the world are cheaper, when all of these subsidies are invisible. But we need to start looking, not only at the money in our pockets, but how our taxes are used against us. More and more people are left little choice but to eat processed, long shelf-life food from far away, because it is cheaper. The tilted playing field means that they cannot afford fresh local food.

At the heart of the modern industrial economy is the principle of 'comparative advantage' according to which it is always in a nation's interest to specialise production for export rather than promote diversified production for local and national needs. As a consequence, economic policies encouraging trade have supported trading institutions which have merged to become the giant transnational corporations that we know today. By now, each of the major commodities on the world market - e.g. coffee, cocoa, cotton - is controlled by a handful of corporations.

This support for international trade has given global players an unfair advantage over local producers and businesses. The result is a tilted playing field favouring monopolies which are growing larger and more powerful every day. In recent years, their power has been boosted dramatically by a series of 'free-trade treaties', such as NAFTA, Maastricht, GATT, and the Multilateral Agreement on Investment (or MAI). Known as the "Multinationals' Charter", the MAI will elevate the rights of companies above those of nations and their citizens. This will give companies the power to sue governments if domestic legislation interferes with trade. These agreements are not about trade between countries but about the rights of transnational corporations to move unimpeded into every domestic market.

Negotiated in secret, wrapped up in highly complex and technical language, these treaties are rarely read, much less understood, by elected officials. In signing on to them, governments are, often unwittingly, undermining their own power. In effect, they are supporting highly mobile global corporations to the detriment of smaller national and local businesses and in so doing impoverish themselves.

Whilst smaller companies operating within the national arena continue to pay taxes, transnationals can shift their assets at a moment's notice to evade taxation. Government power is thus diminishing as more and more revenue is lost in this way. Nation states are therefore getting poorer, forcing governments to reduce expenditure on health, welfare, education and other public services.

As economic policies force giant corporations to comb the globe in search of cheaper labour and resources, social and environmental standards have been progressively lowered in an attempt to compete for capital investment.

The result is that we are locked in a race to the bottom in which everyone loses: jobs, social cohesion, the environment, even the most basic standards of democracy and freedom, are under threat. The irony is that, by paying our taxes, we are supporting the very forces that are responsible for eroding our communities, job security and environmental safeguards.

People everywhere find that their jobs are much less secure, that they are being forced to make more rapid changes in search of employment - in terms of both physical location and skills retraining. Those in employment are increasingly stressed, with ever less time for themselves, their children, or enjoyment of life. Even in the wealthiest of Northern countries - Sweden, Norway and Canada - where homelessness and outright poverty were previously all but unknown, there are signs of extreme social deprivation.

As part of the globalisation process, production is being shifted to low-cost areas in the Third World and Eastern Europe. The related surge of uncontrolled investment into these areas has caused financial chaos and resulted in economic meltdown, as happened in Mexico, the Far East, Latin America and Russia.

The resulting increase in poverty in the South is dramatic: millions of people are being pushed off the land into cities in the hope of a better life. TV, advertising, tourism - all portray urban Western life and consumer culture as superior. The young are highly susceptible to these media images and are persuaded to reject their own culture, in particular any type of work on the land - fishing and farming are now considered primitive and dirty.

As people pour into the city in search of jobs, only a tiny fraction are successful - usually in a sweat shop, mass-producing consumer goods for an unstable Western market. The Times of India (26.8.98) describes the process well:

> "Women and children are emerging as the new 'human cash crop' in South Asia as rapid globalisation drives more and more villagers to distant cities to make good. But most of them end up providing cheap labour in the sex trade."

In addition to the human suffering, the shift of production from North to South has heralded a massive increase in local air pollution, toxic waste and other environmental hazards, in cities like New Delhi, Bangkok and Mexico City.

Whatever the superficial attractions of a global economy dominated by giant corporations, the price is high: a deteriorating environment, increasing poverty, greater insecurity and greater inequality. Worldwide, globalisation also leads to a loss of both economic and political control.

This disempowerment inevitably leads to frustration and anger and an increase in ethnic conflict.

Why the Lack of Political Initiative?

Why in the face of political disempowerment, social and environmental breakdown and growing opposition, do most policy-makers cling to the economic fatalism that surrounds globalisation?

One answer is that they assume that technological change is as beneficial as it is inevitable. They recognise that the creation of the global casino economy has been made possible by the development of high-speed communications. These developments have helped to make that casino extremely difficult to control, monitor and regulate. Because technological change is assumed to be evolutionary, the political consensus is that we have no choice but to embrace it and its economic consequences.

This view of the world has many causes, but prime among them, as mentioned, is an education system which has itself been moulded to suit these same technological/economic developments and which provided us with an ever more fragmented, reductionist world view.

As a result, it becomes more difficult to step back and see the connections linking the whole. While it is true that technology does affect economic choices, it is economic policy that shapes technology - through investments, for example in Research and Development. These cyclical relationships are the product of human policy choices, and are not inevitable in some deterministic way. Once these connections become obvious it becomes equally clear that nation states could regain control of the economic juggernaut.

Seeds of Hope

One of the more hopeful signs today is the willingness of a small but growing number of senior economic and political decision-makers to look at the big picture and to rethink some basic assumptions surrounding globalisation. Prompted by the growing instability and dramatic collapse of markets, financiers such as the late Sir James Goldsmith, George Soros and even Chair of the US Federal Reserve Bank, Alan Greenspan, have warned of the dangers of unregulated and over-heated markets. George Soros recently said before the US Congress that “the global capitalist system is coming apart at the seams”.

Similarly, politicians such as Paul Hellyer, Canada's former deputy Prime Minister, have powerfully argued that the global economy is not about free trade at all:

> “Globalisation is not about trade. It is about power and control. It is the reshaping of the world into one without borders ruled by a dictatorship of the world's most powerful central banks, commercial banks and multinational companies.”

Equally, if not more encouraging, are recent signs of popular resistance. At the grassroots, there is growing interest in the local economy as a counter-weight to globalisation. All over the world communities are taking steps to reclaim control over their lives.

One of the key issues relates to food. Today, the average meal we eat has travelled literally thousands of miles. By encouraging local production for local consumption, communities are weakening the stranglehold of the global economy. Local food means not only better health and less wasteful packaging and transportation; it means money staying in the community, an increase in biological diversity and the revitalisation of rural life. The growing trend towards Community Supported Agriculture around the world provides a direct link between farmers and consumers. More than 40,000 families in the UK now get a regular ‘vegetable box’ from a local farm. In the US, there are now 2,400 registered farmers' markets, with a combined income of billions of dollars.

In a number of places, community banks and loan funds have been set up, thereby increasing the capital available to local residents and businesses and allowing people to invest in their neighbours and their community, rather than in distant corporations.

At the same time, the creation of local currencies enables communities to reduce their reliance on the national (and international) economy. In the small American town of Ithaca in New York, a local currency is accepted by more than 250 businesses.

Local Exchange Trading Systems (LETS), which have sprung up in more than a dozen countries, allow goods and services to be marketed without the need for money. There are already over 400 LETS schemes in the UK alone.

“Buy local” campaigns enable smaller businesses to survive even when pitted against heavily subsidised corporate competitors. These campaigns not only help keep money from “leaking” out of the local economy, but also help educate people about the hidden costs - to the environment and to the community - in purchasing cheaper but distantly produced products.

Local and regional land use regulations are also being amended to protect wild areas, open space and farmland from development. In the United States, land trusts have been created, protecting more than 2.7 million acres of land. In some cases, local governments have used public money to buy development rights to farmland, thereby simultaneously protecting the land from suburban sprawl while reducing the financial pressure on them.

In addition, community-run schools encourage children and their parents to feel more connected to the community of which they are apart, helping to strengthen small towns and villages, while providing much-needed local employment.

Policy Steps

These local initiatives are not enough, however. It is vitally important that change occurs at the national and international level as well. Otherwise attempts to return to 'the local' in an age of giant corporate monopolies could leave communities highly vulnerable and ultimately more disempowered. Unfortunately, many grassroots groups today are oblivious to the enormous concentrations of power in the hands of TNCs and supra-national institutions.

Thus many European Greens are happy to dismantle the nation state in favour of Brussels in the mistaken belief that power can simultaneously be decentralised to the regions.

Nevertheless, increasing numbers of grassroots groups are beginning to recognise that it would be virtually impossible to return power to the local level without the aid of national governments. They are raising awareness about the impact of 'free-trade' treaties and have succeeded in alerting the public to the implications of a single European Currency, 'fast track' policies in the US and the MAI. As a consequence, all of these have been significantly delayed or stalled.

At the same time voters are becoming aware of the destructive impact of the global economy on their everyday lives and of the failure of mainstream political groupings to respond to their problems. As a result a new political agenda is beginning to emerge.

This new agenda identifies the need for electing government representatives who are willing to stand up to the power of the finance markets and TNCs. It also recognises that political leaders must return to the negotiating table to convince their counterparts in other nations of the need to formulate new treaties that will enable them to cease subsidising corporate monopolies. A grouping of sovereign nation states can have the power to create a global economic playing field that not only prohibits monopolies, but protects both environmental and human rights internationally. The details of such a treaty would of course need to be formulated with the involvement of civic society.

As more "miracle" economies collapse, unemployment continues to mount and the impact on the biosphere becomes more obvious, awareness is sure to grow. Before long, we can expect to see a group of nations taking the first steps to create an alliance based on protecting their respective economies, rather than creating trade blocks to try to remain internationally competitive, as is currently the situation.

Perhaps the changes that are required will be boosted by an understanding of what is happening on the other side of the world.

Fifty percent of the world's population has not yet been swallowed up by the industrial economy. This half of the human race - most of whom live in the villages of the South - is often ignored by Northern policy-makers who tell us that slowing down or reversing the process of globalisation is 'unrealistic', 'unthinkable'. According to them the global economy is a 'done deal'.

However, when we bear in mind that an equally large proportion of humanity is free to choose a different infrastructure, a different economic model, then the decentralist solutions proposed here seem more realistic. It is vital that when we contemplate options for the future, we do so from a less parochial, more global perspective. We can reject the centralisation of both state-run economies and corporate capitalism.

Decentralisation is about returning to a balance between the local economy and dependence on international trade; a balance between the rural and the urban, and a balance between the power of communities and distant, anonymous institutions.

Shifting the way our tax moneys are spent in order to return economic, and therefore political power to communities and their elected governments will revive genuine democracy. This economic decentralisation may also be the only way to create structures capable of protecting cultural diversity and the richness of biological systems.

GAIA COMES OF AGE

Dr. Tim Lenton
Institute of Terrestrial Ecology

The pleasant surprises of life often come when you're searching in vain for one thing but you uncover something else that turns out to be far more important. This is as true of science as it is of love or looking for something under the sofa.

In the early 1960s, NASA employed a diverse group of scientists as part of its Viking mission to Mars. Their task was to design ways of detecting whether there is life on the red planet. Most responded by making instruments to go aboard the landing craft and look for life *in situ*, but one objected: Is it necessary to go all that way to answer the question? To stay alive, organisms must continually take in materials from their surroundings, chemically transform them and excrete them in a different form. The atmosphere is a readily available supply of resources and repository for waste products. Thus if a planet harbours life we can expect to see its signature written there, in the composition of gases. There is no need to go to Mars to find out whether it bears life because we can read the composition of its atmosphere with a spectrometer here on Earth.

This typically cheeky suggestion came from the inventor and independent scientist James Lovelock. On taking a close look at the atmosphere of Mars and Earth he found that they are literally worlds apart. The composition of Mars' atmosphere is quite what we would expect from the action of sunlight on physics and chemistry alone. In contrast, the atmosphere of the Earth is a potent cocktail of highly reactive gases that could not co-exist without the incessant activities of life, continually replenishing them. Life's signature is indeed writ large in the atmosphere of the Earth, yet the composition of the atmosphere has remained relatively constant over geologic periods of time. With these two thoughts in mind, Lovelock experienced a "Eureka!" realisation: Life must *regulate* the composition of the Earth's atmosphere.

A new 'top-down' view of life on Earth had been conceived. It grew with the realisation that the Earth's climate and chemistry are remarkably suited to the contemporary biota. For example, nitrogen and oxygen are the main contents of the Earth's atmosphere thanks to the activities of denitrifying and photosynthesising organisms. Nitrogen maintains much of the atmospheric pressure and serves to dilute oxygen, which, at 21% of the atmosphere, is just below the level at which fires would become catastrophically frequent. Yet, there is sufficient oxygen to support the metabolism of large animals like you and I. Furthermore, life has persisted despite major changes in the fluxes of energy and matter to the Earth's surface. Most notably when life started, over 3,800 million years ago, the sun gave out a quarter less radiation than now. But, what evidence we have of the earliest types of life suggests the world was warmer then. As the sun has warmed the Earth has kept cool.

Such remarkable observations demanded an explanation. With the support of the formidable micro-biologist Lynn Margulis, the Gaia hypothesis was born. It proposed that atmospheric composition and climate are regulated *by and for* the biota. Named after the Greek personification of Mother Earth, "Gaia" captured the sense of the ancient wisdom of a "living planet" being re-cast in modern scientific form, and stimulated valuable new research. One example captures Lovelock's unconventional spirit of scientific discovery.

Whilst strolling on the beach in his holiday retreat of Western Ireland, he began to think about the smell of the sea. The sulphur compound responsible is called dimethyl sulphide, and is manufactured by many species of marine algae. Aware of the tendency for the essential elements of life on land to be incessantly washed into the ocean, he predicted that marine organisms would make volatile compounds that can transfer them back to the land surfaces. On a voyage between Wales and Antarctica, Lovelock used a homemade instrument to discover dimethyl sulphide throughout the surface ocean. The product of tiny plankton regulating their internal salt concentration, it closes the loop of the natural sulphur cycle. A later search for the regulators of climate revealed that it is also responsible for seeding the majority of clouds over the world's oceans. Thus, marine algae help to keep the planet cool.

Despite its predictive power, Gaia has met with repeated criticism. The suggestion of regulation *by and for* the biosphere begged the question of how such an apparently complex activity could emerge from the distinct activities of different organisms. When viewed over geological time scales this amounts to asking how a system could have evolved. As one critic put it, must a conference of the species meet to decide the future climate? Lovelock responded with a simple computer model which demonstrates that self-regulation can emerge automatically from the tight coupling of life to its environment. With this mathematical basis, Gaia matured into a theory that views the coupled evolution of life and its non-living environment as a single indivisible process. The resulting regulation of the environment resembles the physiological self-regulation of an organism, although we know it cannot have evolved in the same way. This, together with a tightening of the strait jacket of scientific correctness, led Lovelock to coin the term "geophysiology" to describe the science of Gaia.

Happily, Gaia theory is starting to show signs of flourishing from its first early shoots. A shower of international awards is falling on the fertile soil of Lovelock's imagination. The dawning realisation that the Earth has bounced back from the repeated impacts of massive meteorites, emphasises the robustness of its self-regulation. Meanwhile, the Gaia theory continues to evolve, as we seek to understand how individual organisms can come to contribute to global stability, thus extending Darwin's theory of evolution. The lessons are timely, organisms that alter their environment in a manner favourable to their growth or natural selection gain a feedback advantage. Meanwhile, organisms that foul their nest, however effective they may be over small scales of space and time, are ultimately destined for disaster. If they reach the planetary scale they may well destabilise the whole environment, but this will be their undoing. The inference should be obvious. As I write, El Nino deepens and eyes are stinging in the smoke on the opposite side of the world.

Gaia asks us to look at the world in a different way. As a natural corollary to our first glimpse of the Earth from the outside, the concept has grown and changed over the last thirty years to become a new theory of that Earth and the life it bears. Arriving just as we are starting to feel the consequences of altering our global environment, Gaia is both inspiring and humbling. The Earth may not be fragile but our predicament is. It is in times like these that a new paradigm can be most illuminating.

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REDUCTIONS IN NO_x EMISSIONS

THEIR INFLUENCE ON THE GLOBAL AND REGIONAL SCALE DISTRIBUTION OF OZONE

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Over the last two decades, evidence has accumulated concerning the damaging environmental impacts caused by NO_x emissions from motor vehicles, electricity generation and fuel use in industry, commerce and in the home. NO_x emissions may contribute to episodes of poor air quality in cities during wintertime, to the acidification of soils and freshwaters in remote and sensitive environments, to the eutrophication of soils with the subsequent loss of plant species and to the formation of elevated ozone levels during regional scale photochemical episodes during summertime.

Of all these environmental impacts resulting from European NO_x emissions, perhaps the widest concerns have been expressed concerning the formation of elevated ozone levels during summertime. Internationally-accepted air quality standards, set to protect human health, crops and plants have been exceeded during most summers, in most European countries. Since ozone lifetimes may approach several days during these episodes, long-range transboundary transport is an important aspect of the European regional scale photochemical oxidant problem.

Elevated ozone concentrations result from the sunlight-driven oxidation of organic compounds in the presence of nitrogen oxides. Human activities are the largest sources of both organic compounds and nitrogen oxides in Europe. These elevated ozone concentrations extend over the regional scale, 100-1000 km, downwind of the major industrial and population centres and are superimposed upon the baseline of tropospheric ozone which is global in scale. Regional ozone production is initiated by the photolysis of the global baseline ozone. Subsequently, the photochemical reactions more than make up for the ozone initially lost, stimulated by the intense emissions of precursors within Europe.

During most summers, peak ozone concentrations in most of the heavily populated and industrialised centres of Europe exceed the health-based environmental criteria by factors of up to 2-4 and on upwards of 10-50 occasions per year. Criteria and critical levels set to protect crops and plants are exceeded by factors of at least 10. Air quality policies across Europe have been formulated with the aim of reducing exceedances of health- and vegetation-based standards for ozone to levels which have no long term significance. Because ozone is a secondary pollutant, ozone control strategies must address its precursor emissions, those of organic compounds and nitrogen oxides. Furthermore because of the long lifetime and significant transboundary transport, ozone control strategies should be concerted and coordinated across Europe.

Concerted action to control ozone precursors within Europe has been taken within the framework of the International Convention on Long-Range Transboundary Air Pollution, which is coordinated by the United Nations Economic Commission for Europe in Geneva, Switzerland. There are two protocols to this Convention which relate to ozone and its long range transport. The first is the Sofia NO_x Protocol which commits member states to reducing NO_x emissions back to their 1987 levels by 1994. The second is the Geneva VOC Protocol which commits member states to reducing their VOC emissions by 30% by 1999 relative to their 1988 levels.

For the large part, much of the action taken by member states to reduce emissions of NO_x and organic compounds has involved reducing emissions from petrol-engined motor vehicles through the installation of three-way exhaust catalysts and canisters to control vehicle evaporative emissions. Motor vehicle emission standards are set by the European Commission in Brussels, Belgium, in consultation with the European motor and oil industries.

Although the currently envisaged motor vehicle emission standards should bring about a welcome reduction in emissions of NO_x and organic compounds, these reductions will bring about only a limited reduction in episodic peak ozone concentrations. Indeed, reductions in NO_x and organic compound emissions of up to 90% will be required if the target of eliminating exceedances of the internationally-accepted environmental criteria levels set for ozone is to be achieved. Such reductions in emissions of NO_x and organic compounds are beyond those considered economically or technically feasible.

Reductions in NO_x and organic compound emissions act upon the regional scale ozone production which is superimposed on top of the global tropospheric ozone baseline. However, this global baseline has been steadily rising since pre-industrial times as a result of the increased global scale ozone production driven by the increasing emissions due to human activities of methane, carbon monoxide, nitrogen oxides and organic compounds. This increase in the global tropospheric ozone is expected to continue into the future and should contribute to the enhanced human-induced greenhouse effect. Without further policy action, it will increase ozone baselines within Europe and exacerbate efforts to achieve acceptable ozone air quality.

If air quality policies within Europe are to achieve acceptable ozone air quality in the future, action should be taken not only to reduce the potential for ozone production within Europe, but also to reduce global tropospheric ozone production and hence the input into Europe from the troposphere. The former will require intensified policy action on European regional emissions of NO_x and organic compounds. The latter will require policy action on the global scale emissions of the tropospheric ozone precursors: methane, carbon monoxide, NO_x and organic compounds, within North America, Europe and Asia. The policy process addressing global climate change has yet to address global tropospheric ozone. Until such time as it does, progress towards the achievement of acceptable long term European ozone air quality will be slow.

This work forms part of the research programme of the Air and Environmental Quality Division of the Department of the Environment, Transport and the Regions, through Contract No. EPG 1/3/93. The help of Bill Collins, Colin Johnson and David Stevenson of the Met Office is gratefully acknowledged.

NSCA'S PRIORITIES FOR A SECOND CENTURY

The NSCA's Centenary gives us the opportunity to look at the policy direction for the Society in the short to medium term. The article which follows details one possible set of objectives which has been assembled through the work of NSCA's policy committees and working groups. It is, however, seen as a developing document and members are invited to express their views in writing to Tim Williamson at the Brighton Office, prior to the final version being accepted by the Society at the Annual Conference in October.

In the century since its foundation some of the original objectives of the NSCA have been achieved, but many of the problems that inspired its formation remain. During that period, the NSCA's remit has steadily widened, as new environmental issues have come onto the agenda and the complexity of environmental problems has become more evident. When the Society was formed, and indeed during the first fifty to sixty years of its life, the problem of poor urban air quality was relatively easy to identify, as were the causes and the solutions. However, it is increasingly apparent that each environmental problem is inseparably linked with many other issues and the potential solutions often have a wide range of knock-on costs and spin-off benefits.

The focus of the NSCA has always been air quality and that will remain for as long as there is an air quality issue to resolve. Throughout the 1980s, environmental noise also gained increasing importance with the formation of the National Noise Committee. However, both of these issues must be dealt with in the context of other social, economic and environmental factors if balanced solutions are to be reached. This report looks at the priorities for the NSCA in the coming years, dealing with them on a sectoral basis. Firstly, however, it focuses on sustainable development and the way in which it can provide this contextual view and allow balanced solutions to be developed.

Sustainable Development - a Keystone for the Future

One of the most significant developments in environmental policy this decade has been the development, and acceptance within Government, of the concept of sustainable development. As our understanding of the complexity of environmental issues develops, we need a mechanism by which the connections between environmental, social and economic issues can be handled at local, regional and national level. Sustainable development offers such a mechanism and provides a method by which environmental concerns can be addressed for the benefit of society as a whole. All NSCA concerns, particularly those focused on the management of the local economy and society, come together in sustainable development. It therefore represents a touchstone for future environmental policy for the NSCA and will remain a central focus of all its policies.

Government policy for local government, embodied in the recent White Paper *Modern Local Government: In Touch with the People*, places sustainable development at the heart of local decision making. This policy is to be implemented by a duty, placed on local authorities, to promote the economic, social and environmental wellbeing of their areas through community planning and sustainable development strategies. The NSCA is concerned at the Government's postponement of legislation requiring the duty and will be working to ensure that this omission from the legislative programme is only temporary.

At present there is a wide proliferation of different plans, management tools and policy instruments across a variety of services, which do not link effectively together. The new duty should become the linchpin of a new and more integrated approach to community policy and planning, and the Society has already published its recommendations on how this is to be achieved (A Revised UK Strategy for Sustainable Development, *Clean Air*, Vol. 28, no. 4, 1998). At regional level it is essential that the Government's commitment to regional development, and to regional development agencies, should at its very heart be a commitment to regional sustainable development.

At the same time, the Society is concerned that there is as yet little evidence that the welcome initiatives to embed sustainable development into local government are sufficiently reflected at central government level. It is essential therefore that the review of the Sustainable Development Strategy should result in a programme which is comprehensive and fully integrates areas of government activity, such as trade and industry, and the Treasury, into the implementation of sustainable development. Government should take the lead in introducing a more sustainable and integrated way of working and unless it is at the core of Government, and provides a unifying theme for all elements of it, it is unlikely to succeed.

For the next decade at least, the extent to which they promote sustainable development, will be the common test by which the NSCA's developing policies and practical proposals are judged. As always, given the Society's focus on practical measures and promoting consensus, effort will continue to go primarily into functional areas of air quality, noise, and other sectoral issues. However, NSCA will continue to ensure that these play their part in, and contribute to, the wider progress of sustainable development.

Strengthening Air Quality Strategy

The NSCA's principle objective for air quality is to ensure that the UK's Air Quality Strategy effectively delivers health based standards by 2005, for the general protection of the population, and that standards are progressively extended to take account of effects upon eco-systems, materials and crops.

The Society supports the Government's current review of the Strategy, but is concerned that its current challenging targets should be maintained. The original Standards and Objectives were based on sound analysis and the desire to minimise the health impacts of airborne pollutants, and these analyses remain as valid now as they were when the standards were set. Moreover, where there is a clearly demonstrated benefit to society and if it is realistically practicable, consideration should be given to tightening the standards. While more balanced consideration should be given to costs and benefits within the Strategy, this should inform public and political debate, not replace it. There are many other factors which should inform this debate covering aspects of social and scientific concern. In particular the broad, and largely unquantifiable, public amenity benefits of clean air must be taken fully into account. It should be recalled that the costs of air quality measures have in the past usually been less than anticipated and the benefits often greater.

Nevertheless, achieving the Strategy's targets will not be easy and analysis has shown that they cannot be met simply by national policies which work at the national level. To strengthen the Strategy the Society is pressing for the following:

- stronger incentives to promote cleaner fuels, vehicles, and industrial processes, e.g. fiscal incentives for early take-up of fuels and vehicle standards mandated by the EU for 2005;
- wider powers for local authorities to tackle air quality problems. Local authorities will need strong political backing to take up measures such as congestion charging, low emission zones and restraints on non-residential parking, if their wide environmental benefits are to be realised;
- stronger links between air quality and planning and transport in public authorities. These links remain tenuous, although making air quality a 'material consideration' in planning decisions has produced dividends. Local air quality management plans now need to be brought together coherently with planning and transportation measures within the framework of local sustainable development plans.

Concentration on these immediate objectives must not, however, be allowed to obscure the emerging medium and longer term issues to which research programmes and policy development should now be geared; such issues include:

- the rapid increase in understanding of the science and medical effects of fine particles is likely to lead to a radical revision of the way we perceive the health effects of air quality. It is essential this work is pressed forward quickly and is well resourced;
- while work in recent years means that the short term health effects of exposure to air pollutants are now better understood, chronic effects remain largely unknown. This requires difficult research, over a lengthy period which will require stable financial support;
- policy rightly focuses on securing air quality standards over a variety of outdoor settings. Less attention has been given to personal exposure of specific social groups to a variety of indoor and outdoor settings. Concepts of personal exposure must provide a framework for research and policy development;
- the finding that pollution levels within vehicles are substantially higher than those outside has fundamental policy implications which need to be addressed. Further, better public information should be available on sources of air pollution in the home.

Action on Environmental Noise

Problems of environmental noise have long been neglected in the UK, by comparison with elsewhere in western and northern Europe. Effects on physical and psychological health may be less clear-cut than in the case of air quality, but for a small minority in the case of neighbour noise, and for the community at large in respect of public amenity, they can be severe.

Responsibility for noise within Government has traditionally been scattered among a wide variety of functions and departments, resulting in a lack of coherence and focus in addressing the issues.

The NSCA believes the Government should now commit itself to preparation of an Integrated Strategy to tackle environmental noise. Recent developments in techniques of noise mapping provide a basis for this. The prospect that the EU may before long legislate on noise mapping makes it important that the UK quickly get its act together.

Within any strategy, an immediate priority must be to prevent any deterioration of Britain's noise climate. More generally, the key areas of the strategy should be as follows:

- it should be effects-based, i.e. focus on actual exposure to noise from all sources, not just specific emissions;
- it should consider all emissions and abatement options equally in terms of their cost- effectiveness;

- it should incorporate the Government's promised review of the Noise Act and, while maintaining local authorities' discretion to respond to local circumstances, should ensure that minimum standards of protection against neighbourhood noise are generally available.

Acidification & Tropospheric Ozone

The Society has long campaigned to ensure that problems of acid rain are effectively addressed. It has therefore welcomed the progress made at European level, largely through the Long Range Trans-boundary Air Pollution (LRTAP) Convention, to reduce emissions and deposition of sulphur dioxide. Further progress is however required on acid deposition, particularly in respect of nitrogen species, and on the intractable problem of ground-level ozone, whose character requires a multi-national approach.

The Society considers that there is scope within EU and LRTAP negotiations to secure significant further downward pressure on acidifying and ozone-creating emissions. However, it is essential that the credibility of this process at European level be underpinned by stronger Governmental effort and public interest in several areas, including:

- clearer assessment of the environmental impacts of acidic deposition, building on work recently undertaken by the Society;
- increased resources from central Government for the LRTAP Convention, to enable it to improve the quality of technical work, in particular on costs and benefits and on abatement techniques.

It is essential that the Strategy which emerges for acidification and ozone in Europe be realistically based, and be set within the LRTAP framework - embracing Russia and Eastern Europe and, where relevant, North America - rather than the unduly restricted framework of the current European Union.

Delivering Climate Change Targets

The Government's commitment to a reduction of 20% in "greenhouse gas" emissions by 2010 represents a major policy challenge which will have important implications. In line with its members' expertise, the Society's principal interest will be to help ensure that the targets are achieved as economically and effectively as possible, and in ways which effectively reinforce other environmental objectives. Particular priorities will be:

- to ensure that transport measures in support of lower carbon dioxide emissions do not prejudice achievement of health-based standards for ambient air quality pollutants;
- given the short payback times and associated social benefits, to support increasing investment in energy efficiency across the economy, and in particular in the domestic sector;
- since implementation of IPPC offers the opportunity to promote energy efficiency in industry, and to provide for a framework for systems of emissions trading, to utilise these as a means for achieving greenhouse gas reduction targets.

Industry and the Environment

In recent years, industry has made substantial advances in reducing its environmental impact and responding positively to environmental concerns. The Society will work to maintain its long-established role in promoting communication and dialogue between industry and local authorities and other regulatory bodies, as the only sensible basis on which effective policies can be developed. The long term objective must be a framework for industrial activity which is both economically efficient and effectively embodies principles of sustainable development. In the shorter term there are three important priorities for which the Society will work:

- the introduction of the IPPC Directive provides an opportunity for a more coherent and integrated framework for the variety of respects in which industrial activity can impinge upon the environment. Full advantage must be taken of the opportunity to take account in the regulatory system of site restoration, energy efficiency, safety and other considerations. However, the emphasis must be on making systems as simple as possible;
- more widely, the opportunity must now be taken to bring together the separate systems for regulating industrial emissions with those for the general environmental management of a company's operations, in the interests of simplicity, transparency and minimising the burdens on industry itself;
- improvements in environmental performance have, in general, been more rapid with the larger companies than with small and medium-sized enterprises. These need more positive support to adopt effective environmental management, and ensuring that this is available should be a priority for local and central Government alike.

Managing the Local Environment

Many of the policies with which the NSCA is most closely concerned come together, and have their main impact, at local level. It is also the level at which they interact most completely with health and social policies, but current conflicts and incompatibilities prevent effective advantage being taken of the potential synergies. There is inadequate scope for local authorities to prioritise between local services in terms of local circumstances. Capital investments can often fail to achieve the long term benefits they were set up to provide because of inadequate resources for maintenance and management. In disadvantaged communities people can be alienated from local authorities by the failure to find adequate means of effective delivery of local services; and by the failure to enforce controls on environmental nuisances such as litter and petty vandalism.

New approaches promoting the more effective integrated environmental management of local areas need, over time, to be developed, and adequate priority and resourcing must be given to this. In the meantime, urgent consideration should in particular be given to:

- improvement of the environmental management of deprived areas and run-down estates, as an essential prerequisite for their social regeneration;
- the need to review more carefully the contribution that can in practice be made by formal and informal environmental management systems, in specific local conditions.

Contemporary patterns of life and the changing housing demands of successive generations has meant a constantly rising demand for new housing. If this increasing number of households is in large measure to be accommodated within existing urban areas, to minimise impact on the countryside, a renaissance in our urban areas is required. This will require, as an early priority, radically enhanced attitudes, and new techniques, in local environment management.

NSCA - Into the New Millennium

In terms of the environment, the last ten years have seen important changes in the social and political climate both in this country and across Europe, changes which will continue to drive the environmental agenda through the early part of the next century. In particular, the traffic on our roads has reached a critical level and the public now accepts that action must be taken to combat poor air quality and the congestion which is now commonplace. More fundamentally, governments have accepted that environmental concerns have a significant impact on social and economic policies and that, conversely, social and economic concerns must figure in environmental policy. Importantly, both government and industry have come to realise that environmental protection is not necessarily bad for business and that it can in fact provide the driver to make business sharper and more efficient. NSCA will play its part in ensuring that the momentum of recent years is not lost, as it moves into its second century and as society moves into its second millennium.

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NSCA News & Views

REVIEW OF THE UK NATIONAL AIR QUALITY STRATEGY:

Introduction

The National Society for Clean Air and Environmental Protection (NSCA) welcomes the opportunity to comment on the results of the Government's first review of the UK National Air Quality Strategy. NSCA is gratified that the review has strengthened and further developed many of the important and innovative elements of the Strategy and by the clear evidence which the review gives of the Government's commitment to the continuous improvement of air quality in the UK. A summary of the Government's proposals was included in the last issue of Clean Air, March/April 1999, pp.50-51; nb the 24 hr mean for SO_2 should read 46.8 ppb.

The review of the National Strategy and some of the work surrounding it has helped to expand the sphere of knowledge on the current "pollutants of concern", especially in the field of particulates. The APEG report on source apportionment of particles has pushed the expertise in the UK to the forefront of this area, although there is more work to be done. Work on the health effects of fine particles has made this the fastest moving area within epidemiology and is providing an ever more sophisticated view of the costs, both in monetary and social terms, of air pollution.

The Review Process

The Review has covered four essential tasks:

- to revisit and recalculate the projections made for air quality in the formulation of the original National Air Quality Strategy in 1997;
- to integrate European air quality limit values with those in force in the UK;
- to estimate the costs and benefits to the UK of achieving the National Air Quality Objectives; and
- to evaluate the actions which can be undertaken to achieve the Objectives.

The UK National Air Quality Strategy must remain a useful, vibrant and above all, relevant document if it is to achieve the goal of informing policy and action to improve air quality and protect both the human population and the environment as a whole. However, the process must not make the error of producing amendment for the sake of amendment; change can often be confused for action and there is much that can be said in support of consistency. The aim must be stability in the air quality objectives linked to continuous review and reassessment of progress towards them and the options available to achieve them.

While it is acknowledged that the development of our understanding of the sources and nature of airborne pollutants may justify some adjustment of the UK objectives, NSCA believes that this should not be the overriding focus of the review. Predictions of future air quality trends and levels contain a large degree of uncertainty and, therefore, changes to the air quality objectives should be treated with caution. In addition, the disturbance caused by changing the objectives should be kept to a minimum, allowing policy makers at both local and national level a period of stability in which to make real progress toward them. The focus should instead be on the measures needed to meet the objectives with rigorous analysis of their relative contribution and an assessment of the further measures needed, if any. However, the current review appears to have given most weight to adjustment of the objectives and the cost-benefit analysis of achieving them. Relatively little attention has been given to the analysis of measures to help meet the objectives, particularly local level measures and actions.

This response will look at each of the Chapters in the review document in turn, commenting on both the general and specific issues contained within them. However, some of these issues will cross over between chapters, particularly for Chapters 2, 6 and 7. The view taken by NSCA in responding to this review is informed by the following principles:

i. The review should focus principally on measures to achieve the objectives rather than on adjusting the objectives themselves.

ii. The review should be guided by the precautionary principle, particularly where uncertainty exists.

iii. The review outcomes should state clearly what is to be achieved and avoid ambiguity and confusion.

iv. The Air Quality Objectives should remain as close to the Standards recommended by EPAQS as possible, or match the EU Air Quality Limit Values, whichever is the more stringent.

v. The review should recognise and value the contribution which can be made towards achieving the objectives by action at the local level, both by local government and by non-governmental action.

vi. The review should recognise the potential contribution of action taken at local level and seek an optimum balance between national and local policy initiatives.

Chapter 1 - Setting the Scene

NSCA welcomes the high profile the Government has given to sustainable development within the review and is encouraged by the clear and explicit links made between air quality and sustainable development. The forthcoming UK Sustainable Development Strategy will hopefully build on these links and draw air quality closer to planning, transport and economic policies.

Chapter 2 - Summary of Recommendations

This Chapter provides the main focus of the review and, to a certain extent, the rest of the document is background, supporting and contextual material for it. Essentially, the recommendations from the review are an attempt to reconcile the current and likely future requirements of EU legislation and the revised projection of air quality in the UK in 2005 and beyond. The review proposes changes to the compliance dates for most of the existing objectives, to the concentration for one objective and introduces several new objectives. The result is a complex pattern containing eleven objective levels, one provisional objective level, four indicative levels and six different compliance dates for nine pollutants.

This result is unnecessarily complex and confusing, both for air quality practitioners and the general public. If the amended air quality Strategy is to command the same level of public confidence as the original, the issue of clarity must be urgently addressed.

Compliance Dates

The argument for bringing forward compliance dates, as in the case of benzene and 1,3-butadiene, which are projected to have been achieved prior to 2005, is well understood. The Government's desire to maintain a downward pressure on pollutants for which there is no known "no effect level" is welcomed. However, to suggest that the projected early compliance provides an opportunity to bring forward the dates suggests that the Air Quality Objectives are led by events rather than giving a new impetus to policy measures.

Furthermore, we do not feel that the Government has fully taken into account the effect that altering existing compliance dates will have on local authorities currently undertaking review and assessment. By the time the proposed objectives become law, many local authorities will be reaching the end of the process and these changes will require an immediate review of the results of review and assessment. For example, the guidance on review and assessment LAQM.TG4(98) states that, in stage one for benzene, the authority should list:

"all process and activities which have the potential...to emit significant quantities of benzene and...are expected to be in existence and/or operational by the end of 2005..."

Therefore, when the Air Quality Regulations 1997 are amended to incorporate the new compliance dates, local authorities may have to repeat the review and assessment process for benzene, 1,3-butadiene, carbon monoxide, and lead, in addition to including the new objectives for PM_{10} and sulphur dioxide. There will, as a result, be a resource impact for local authorities which the Government should take into account.

Provisional Objectives and Indicative Levels

The review recommends the inclusion of one provisional objective, for the annual mean of nitrogen dioxide concentrations, and four indicative levels. The original Strategy also contained provisional objectives and in Chapter 3, paragraph 21, of that document it is explained that the provisional status simply indicates that these objectives are most likely to be changed in any subsequent review. It also states that *"Unless and until they are changed, they are to be treated in just the same way as the other objectives"*. However, it has become apparent that all of the objectives are subject to change and, in fact, the only objectives that remain unchanged are those which were originally tagged as provisional. If provisional objectives are to be treated in the same way as other objectives and if all objectives are as likely to change regardless of their status, why tag any as provisional?

Indicative levels will *"act as pointers to the direction that future policy is expected to take* [and will] *be reconsidered as part of the next review of the Strategy."* However, their inclusion alongside firm objectives, merely serves to "muddy the waters" with regard to what does and what does not have a statutory basis. The review gives no indication as to how these indicative levels are to be used in, for example, evidence to public enquiries or similar planning issues. If the Government wishes to give a clear indication of policy then it should adopt the indicative levels as firm objectives, which are then subject to a two year review in the same way as the other objectives.

The combination of objectives, provisional objectives and indicative levels will create a highly confusing system and will make the task of public education more difficult. It was hard enough for local authorities to get across the concept of air quality objectives based on rolling averages and percentiles and which apply in 2005 rather than now. The inclusion of non-statutory indicative levels and a variety of compliance dates will not help the situation.

The NSCA is not persuaded by the arguments for the inclusion of provisional objectives or indicative levels. Only firm objectives with clear timescales and underpinned by sound standards should be included in the Strategy.

Compliance with EU "Air Quality Daughter Directives"

The transposition of EU Directives into the UK air quality system will impose some significant changes on the UK air quality objectives. The EU limit values have used essentially the same background data in their formulation but there are some important differences, as compared to the UK system, which must be taken into account. These are, essentially, compliance dates, measurement units and exceedances allowed. The Government should give serious consideration to the following:

i. Changing the compliance date from 31st December to 1st January in a given year in order to achieve greater consistency with the Air Quality Daughter directives.

ii. Using $\mu g.m^{-3}$, at 20°C and 1013 mB, rather than ppb ($mg.m^{-3}$ rather than ppm in the case of carbon monoxide) as the standard unit. This would avoid anomalies such as the proposed 104.6 ppb NO_2 objective when transposing EU Directives and would make comparison with air quality measurements in other parts of the world easier.

iii. Using exceedances per year (as is already proposed for four objectives) rather than percentile values. This has the advantage of being more clear to the public in addition to consistency with European Law. However, such a conversion should not be used as an opportunity to weaken the objectives.

Objectives for the Protection of Vegetation and Ecosystems

The inclusion of the new objective for oxides of nitrogen (for the protection of vegetation) and sulphur dioxide (for the protection of ecosystems) is welcomed. However, they apply only to specified areas (i.e. those more than 20 km from conurbations of over 250,000 people and 5 km from 'Part A' processes, motorways or built up areas) and not, in the strictest sense, nationally. Therefore, in order to avoid confusion, there should be a clear separation between these and the other, health based objectives. Furthermore, the Government should widen the application of these new objectives to include areas designated under the EU Habitats Directive.

Other Issues

There are a few errors contained in Table 2.1 which, while they have in all probability been noted by DETR officials, are drawn to the Government's attention:

i. The new annual national objective for the protection of vegetation is for NO_x, rather than NO_2 as is implied by the table.

ii. It should be stated in the Review Outcome column of the table that the indicative level for ozone is measured as the 97th percentile of the daily maximum 8 hour running mean.

iii. The 100 ppb, 15 minute objective for SO_2 should be measured as the 99.9th percentile, not the 99th as stated in the Review Outcome column of the table.

There would also appear to be an anomaly in the proposed objective for nitrogen dioxide. In proposing, as it must, the EU limit value of 104.6 ppb, the Government has created an objective which is substantially lower than the Air Quality Standard, currently at 150 ppb. As this would appear to contradict the definitions for standards and objectives, we propose an amendment of the standard to 100 ppb. In addition, the proposal of 104.6 ppb makes something of a nonsense of the objective as standard instrumentation cannot measure to this level of accuracy. We propose, therefore, either an objective level of 100 ppb (with 18 exceedances per year) or to use $\mu g.m^{-3}$ as the standard unit.

Pollutant specific comments will be covered under Chapters 7 and 8.

Chapter 3 - Legal Framework

Domestic Framework - Planning

NSCA welcomes the links made thus far between the planning framework and air quality issues, and the guidance issued on planning in conjunction with other LAQM guidance. However, the experience of many air quality professionals working within local authorities has been that this guidance has been overlooked by planning authorities. While it is not suggested that the government create a dual system of control for air quality at the local level, more could and should be done to bring the air pollution control, planning and transportation professions closer together. The National Air Quality Strategy should ensure that there is a clear and explicit link between air quality management plans and development plans. We urge the Government to establish this link by requiring that development plans for local authority areas need to provide advice and policy to improve air quality within their area. Furthermore, a clear link needs to be established between the action plans which are being prepared by local authorities and development plans (i.e. unitary, structure and local plans).

The National Strategy should also elaborate how local authorities should have regard to the importance of air quality as a material consideration in the granting of planning consent for major developments. At present, no change is proposed for Town and Country Planning legislation. The National Air Quality Strategy should ensure that air quality is given a higher priority in terms of determining planning consent for development. The Strategy recognises that, in the long term, planning has an important role to play in improving air quality by influencing the location of future development. Town planning cannot deliver this without greater emphasis being given to air quality in development plans and in the determination of individual planning decisions

Chapter 4 - Relationship Between other Government Initiatives and the National Air Quality Strategy

NSCA welcomes this review of the links between air quality policy and other Government policy areas. We recognise that Devolution may have important implications for the National Air Quality Strategy, particularly as the devolved bodies will have the power to set different air quality standards and objectives.

Although many important initiatives have been identified, along with the need for bodies with air quality responsibilities to work together, no mention is made of measures to protect the public and non-workforce personnel in premises where activities are such that they may be exposed to occupational levels of pollution. We therefore urge the Government to review the links between the Health and Safety at Work, etc. Act (1974) and the National Air Quality Strategy to ensure that both are taken forward consistently.

Chapter 5 - Costs and Benefits of Air Quality Objectives

The need to assess the economic effects of environmental policies is clear; not to do so would be to ignore one of the three aspects - environment, social and economic - of sustainable development. Equally, there is a need to assess the environmental and social effects of economic policy and the economic and environmental impacts of social policy. In support of this philosophy, the Government, or at least DETR, does have a commitment to subject new policies to environmental appraisal. However, NSCA believes that such appraisals are not given the same profile as the cost and benefits study has had within the review document.

The general approach to cost and benefit analysis taken during the review and the formation of an interdepartmental working group would appear to provide a good model for dealing with complex multi-interest issues in the future. Also, limiting the analysis to additional measures required to meet the objectives would seem a sensible approach. We fully appreciate the amount of work which has been put into this part of the review and understand that the report produced, which this Chapter summarises, does not represent the finished product.

However, it is noted with some disappointment the inconclusive nature and high variability of the results obtained thus far. While there is obviously some way yet to go, as the list of items for further research in paragraph 161 illustrates, the question must be asked how much the final results can contribute to the objective setting process. There is also some concern that the high "margin of error" inherent in this type of work will merely provide a justification for any given policy or objective. When presenting a cost and benefit analysis, it is highly important to identify all significant assumptions made and to be explicit about uncertainties. We do not oppose the inclusion of cost-benefit analysis within the review process, we simply question the obvious prominence it has been given.

Chapter 6 - Pollutants Currently Covered by the National Air Quality Strategy

Benzene

Benzene is a carcinogenic pollutant for which a "no effect level" has not been identified and there is, therefore, no safe limit value. NSCA therefore welcomes the Government's stated intention to reduce levels to as low as is reasonably practicable. However, it would strongly urge the Government to adopt the proposed indicative level (of 1 ppb to be achieved by 2005) as a firm objective for inclusion in the Air Quality Regulations.

1,3-Butadiene

Comments for this pollutant closely mirror those for benzene, although we would urge the Government to propose, and adopt, a longer term objective for 1,3-butadiene at the earliest opportunity.

Carbon Monoxide

The Government's commitment to introduce more ambitious targets wherever possible is welcomed. However, projections suggest that the level proposed for the EU Daughter Directives (of approximately 8.5 ppm rather than the current proposal of 10 ppm) is also achievable by 2003. It is therefore suggested that the introduction of this level now would alleviate transposition problems at a later date.

A recent report by the Institute for Environment and Health concludes that performance decrements can occur in some people exposed to carbon monoxide, and it would be prudent to conclude that there is no threshold of effect in patients suffering from cardiovascular conditions. Peak concentrations may, therefore, be more relevant than longer term averages. NSCA asks that the Government give consideration to a 15 minute objective for carbon monoxide which would be of particular relevance to people exposed to local peak concentrations in congested areas.

Lead

A longer term objective for lead in air of 0.25 $\mu g.m^{-3}$ to be achieved by 2008 is welcomed.

Nitrogen Dioxide

NSCA welcomes the Government's proposals to introduce the EU Daughter Directive levels as UK Objectives to be achieved by 2005, rather than 2010 as the EU proposals require. It is accepted that for many urban areas, London in particular, this is a challenging target. It also serves once again to highlight the need to empower local authorities to take action on a local level, in partnership with the Government acting at a national level. It is only through such concerted action that the objectives will be achieved and the Government must therefore recognise and support local authorities in their task.

As previously stated, we see no value in tagging the objective for annual average nitrogen dioxide levels as provisional. As all of the objectives are subject to review, and as the objective for nitrogen dioxide is included in the Air Quality Regulations, therefore having a legal status, the "provisional" tag would appear to be superfluous.

Ozone

Compliance with the UK objective for ozone relies largely on action at a European level and, under the current timescale, the UK objective is probably not attainable. However, the use of indicative levels is not supported and the Government is therefore urged to adopt a firm objective for ozone with a realistic compliance date.

In addition, the Government should adopt a more proactive approach to the control of ozone precursors, particularly VOCs. While action at the UK level is unlikely to achieve the current objective, it can have an impact on ozone levels nationally with consequential benefits to health. In addition, any European strategy on ozone control will have to develop, through regulation, advice, fiscal incentives and other means, a "low VOC culture" in the industrial, commercial and domestic markets. Developing such a culture in the UK prior to its imposition from the EU will give UK companies a head start in terms of the development, purchase and use of new products.

Particles

NSCA fully recognises the difficulties faced by the Government in achieving the current UK objective for particles. We also recognise the obligation placed on the Government to transpose the Air Quality Daughter Directive limit values for Particles into UK Law. However, the conversion of the current UK objective into an indicative level is not supported, nor is the introduction of the Stage 2 Daughter Directive limits for 2009 as indicative levels.

The production of the APEG report *Source Apportionment of Airborne Particulate Matter in the United Kingdom* is welcomed, as is the greater understanding of the nature and sources of particles which it represents. Using the findings of this report, the review has concluded that the original particulate objective is not achievable in the current time frame. However, as it is the pollutant which is currently of greatest concern in terms of health effects, the Government's commitment to reduce particulate levels beyond the Daughter Directive Stage 1 limit value is welcomed.

In view of this, and the fact that the National Air Quality Strategy will be reviewed again at least once prior to 2005, the Government should maintain the current objective for particles as a firm objective. This would send the clearest possible signal of the Government's intentions and provide the direct impetus for action on the causes of poor air quality. Much has been made, at the launch of the review and subsequently, of the contribution of secondary particulate originating from continental Europe in exceedances of the UK objective levels. Certainly in exceptional years, this contribution is significant and beyond the direct control of UK Government. While we welcome the Government's commitment to raise the issues with its European partners, we feel that the UK should be planning for typical years and not the atypical years such as 1996.

According to the review document, under typical meteorological conditions, approximately half of the UK particle load is made up of a combination of largely naturally occurring coarse particles and secondary particulate of continental European origin. This means that the other half is of manmade origin, generated within the UK and therefore subject to the influence of UK Government policies. Therefore, while action at the European level is vital to achieve long term improvements in air quality, there is a substantial amount of work which may be carried forward unilaterally by the UK. In addition to improving the health of UK citizens and saving the National Health Service significant resource expenditure, this would put the UK in a strong bargaining position within Europe.

The current review is based solely on national policies and takes no account of the action which may be taken by local authorities to address air pollution in their areas. Despite the large amount of effort being put into modelling and into Cost-Benefit analysis, there has been no assessment of what can be achieved by local measures. Nor is there an assessment of the likely impact of the measures set out in the Transport White Paper, in spite of the fact that these may have a significant impact on particle levels in urban areas. Predictions for typical climate conditions suggest that, for the majority of the UK, the objectives are achievable, with some additional effort. Therefore, relaxing the UK objective to the EU limit value (which was set to take account of the larger volumes of coarse particles, i.e. dust, in Southern European States) means that large areas of the UK will have little or no incentive to introduce particle reduction policies through, for example, Local Transport Plans.

However, it is recognised that maintaining the current objective will result in a large number of local authorities having to undertake Stage 3 reviews for their areas and subsequently declaring Air Quality Management Areas (AQMA). The implications of this are that while there will be an increase in the resource expenditure by local authorities, it will provide a far clearer and more detailed picture of the likely exceedance of the objectives in 2005. As particles are of the greatest concern in terms of health effects, this expenditure is justified in urban areas. Under current guidance, authorities whose particle problem arises from sources beyond their control (for example through emissions from a motorway or from areas outside their boundaries) will be required to carry out expensive and sophisticated monitoring and modelling work. This would probably be excessive for some areas and would not in any case provide any additional or helpful information. Therefore, in order to prevent wasted resources, the statutory guidance for Stage 3 Review and Assessment for PM_{10} should be revised. The aim of the revision should be that local authorities whose particle problem arises only from sources beyond their immediate influence should not be required to carry out a Stage 3 Review and Assessment. As the three stage process is only referred to in guidance, this change will not require amendment to the legislation.

Declaration of an AQMA requires the preparation of an action plan, which must set out how the authority intends to use the powers at its disposal to achieve the objectives. Guidance on AQMAs should require an assessment of how much can be achieved locally through, for example, local transport plans, low emission zones, voluntary agreements, information campaigns, etc. As a result, a detailed national picture of what can be achieved by both local and national Government will be built up, giving a clear indication of the requirement for further measures at national and EU level.

The action plans should be ready in time for the next review of the Strategy in 2000-02. Weakening the current objective at this stage would mean that this detailed, national picture will not be assembled and would therefore ignore the possibility of making a better informed decision in 2002. It should also be understood that an indicative level will not provide the driving force for the development of this more detailed understanding of the UK particle climate and the possibilities for its improvement.

NSCA urges the Government to adopt the Daughter Directive Stage 2 values as firm objectives, again in order to secure necessary health improvements and to send clear signals of intent both within and outside the UK.

There is, of course, much concern over the question of standard measurement methods for particles. This is particularly acute among local authorities who are currently assessing their budget provisions for increased air quality monitoring. We recognise the difficulty which faces the Government over this question and urge it to seek a solution at the earliest possible juncture. Once again, it is important that local authorities and other stakeholders are kept informed of progress on this issue and that the signals sent out by the Government are as consistent and clear as possible.

Sulphur Dioxide

NSCA welcomes the Government's decision to retain the current objective as a firm objective.

Chapter 7 - New and Future Standards and Objectives for Pollutants

The introduction of firm objectives for sulphur dioxide (for the protection of ecosystems) and for oxides of nitrogen (for the protection of vegetation) is welcomed. However, we feel that these should also apply to areas designated under the EU Habitats Directive, in addition to their currently stated application.

Chapter 8 - Measures and Powers to Help Achieve Objectives

The process of setting, and reviewing, air quality standards and objectives is of little worth unless there are effective measures and powers to achieve those objectives. We welcome the amount of work which has been put into some areas, such as long term pollutant modelling and source apportionment of particles. However, it regrets that relatively little work appears to have been put into an assessment of the relative contribution the measures and powers covered in this section can make towards achieving the air quality objectives. In particular, a quantitative assessment of the contribution which could be made by action taken at a local level would be of great value to local authorities in the development of their action plans and local air quality strategies. We hope that this will be rectified in the next review of the Strategy.

It is noted, with regret, that Local Air Quality Management and Air Quality Management Areas are mentioned only once in this Chapter, despite the fact that these are the only tools currently available to local authorities designed specifically to deal with ambient air quality. We also note that the declaration of an Air Quality Management Area confers no additional powers on the local authority to deal with the air quality problem. Therefore, local powers should be aimed at avoiding the declaration of an AQMA and that this should be a clearly stated intention of the Government.

Local Authority Powers - Industrial and Domestic Sources

The Government has shown continued support for the smoke control regime introduced by the Clean Air Acts. A very large number of local authorities have now declared Smoke Control Areas which cover a high percentage of their districts, if not the entire district. Smoke Control Areas have certainly played an important role in the improvement in urban air quality in the last half of this century. However, these powers were developed to address the gross pollution problems caused by domestic and light industrial coal burning and are not directly related to either quantitative emissions or ambient air quality.

Local authorities who are still actively engaged in domestic smoke control have found the provisions of the Clean Air Act 1993 difficult to enforce and not easily related to the national air quality objectives. The Government should therefore carry out a full review of the Clean Air Acts with a view to adapting their very useful concepts to the current system of local Air Quality Management. NSCA has been undertaking work in this area, through its Solid Fuels Working Group, and is currently carrying out a survey of all local authorities to assess the severity and nature of solid fuels problems. We would be happy to contribute the results of such work to any review of this legislation.

In terms of industrial emissions control, clarification of the following two points is felt to be necessary:

1. Whether a local authority can vary the conditions of an LAPC Authorisation (or request that the Environment Agency vary the conditions in terms of an IPC Authorisation) to go beyond BATNEEC as defined by the Secretary of State's Guidance Notes, where a process has been shown to be a sole or significant cause of a local air quality problem; and
2. How IPPC relates to the UK air quality objectives. It would appear from the IPPC Directive that IPPC permit conditions can be set in support of Air Quality Daughter Directive limit values but not national objectives, where these are more stringent.

Local Authority Powers - Transport Sources

The Government should ensure that the statutory reports made by local authorities under the Road Traffic Reduction Act 1997 contain an assessment of the air quality impact of traffic reduction targets or predicted growth.

The Government should also make a firm commitment to extend the Road Traffic (Vehicle Emissions) (Fixed Penalty) Regulations 1997 to cover the whole country at the earliest opportunity. However, as with all transport based powers conferred on local authorities, success depends on their being adequate funds for effective enforcement and on securing the co-operation of enforcement agencies, such as the Police.

The Integrated Transport White Paper - Local Transport Plans

NSCA welcomes the introduction of the Local Transport Planning system by the Government and shares the Government's hope that it will deliver more coherent local transport systems and redress the current imbalance in modal choice. Where local authorities find themselves in the position of having to declare an Air Quality

Management Area for NO_2 or PM_{10}, it is likely that the Local Transport Plan will form the substantial part of any Air Quality Action Plan. It is therefore of paramount importance that the development of the two plans is closely tied, or even merged, by the local authority. While the Government has made good links between the two in guidance documents, for example, the Draft Guidance on Local Transport Plans published in November 1998, these links could be strengthened. In particular, the guidance on Local Transport Plans should require local authorities to incorporate the results of the Air Quality Review and Assessment carried out under Part IV of the Environment Act 1995 within the plan. It should also provide an assessment of the contribution made towards improving local air quality which will be made by implementing the plan.

The timescale for finalising local transport plans has caused concern; a provisional plan must be produced by July 1999 and a full plan by July 2000. As Local Transport Plans cover a five year period, the current development stage is the only opportunity to include review and assessment results and incorporate action plans prior to 2005. While most local authorities will have completed review and assessment by early 2000, strong linkages now will make the process of incorporation easier and quicker.

The Integrated Transport White Paper - Proposed New Powers

The proposals, outlined in the Transport White Paper, to introduce road user charging and workplace parking levies are welcomed. These measures have the potential, if implemented correctly, to transform the structure and pattern of urban transport provision in a relatively short time. Hypothecation of the revenue raised by these measures, ensuring that it is spent on local transport improvements, must be a permanent feature and not simply for a fixed time period.

However, we regret that the Government does not appear to have a clear timetable for introducing these measures, other than in the London area. There is, therefore, serious doubt as to whether the measures will be in place by July 2000, i.e. in time for inclusion in local transport plans. If they are not included in such plans, they are unlikely to be implemented before 2006 and will therefore make no contribution towards achieving the air quality objectives.

Other Transport Measures

It is a principle of good regulation that measures should not be put in place unless there are sufficient resources available to enforce them. Unfortunately, for many of the transport measures both proposed and in place, such as low speed zones, Low Emission Zones, bus lanes, High Occupancy Vehicle Lanes, etc., a lack of resources for enforcement severely undermines their effectiveness. The Government should ensure that such resources are made available to local authorities and should review the current enforcement arrangements. While it is currently the responsibility of the Police to enforce most of these transport measures, some forces have been unwilling to assist local authorities in their implementation and this has led to the failure of some schemes. The Home Office needs, therefore, to assess the role of the Police in local transport issues, in conjunction with DETR. NSCA believes a number of motoring offences should be decriminalised and subject to enforcement by traffic wardens or other local enforcement officers.

The Government's support for work on low emissions zones, clear zones and home zones is welcomed. However, we urge the Government to widen the focus to include an assessment of the implications of these projects on the noise climate and on improvements to the general urban environment. These "spin-off" issues will encourage the wider uptake of such schemes with a consequential impact on both air quality and urban revival. We also urge the Government to include consideration of these issues in the preparation of its Urban and Rural White Papers.

Education and Publicity

The Government's campaign "Are you doing your bit?" has played an important role in raising public awareness of transport and air quality issues. However, the Government should expand its publicity and education activities in the following areas:

i. Practical advice and support for companies wishing to introduce green travel plans and for schools wishing to develop school travel plans. These two initiatives can play an important role in reducing both peak time congestion and total traffic load. However, the lack of practical information and support will discourage many companies and schools who would wish to become active in this area.

ii. A national campaign to raise awareness of the National Air Quality Strategy and of the action currently being undertaken in this area by all local authorities. A raised general awareness of the Strategy will greatly assist local authorities currently trying to engage the general public in the process of Local Air Quality Management. Such engagement will be vital if action plans and local strategies are to be successful.

Fiscal Measures

NSCA welcomes the Government's commitment to effecting environmental improvements through fiscal incentives. The Chancellor's budget statement in March contained many useful developments, in particular the introduction of a variable Vehicle Excise Duty based on vehicle emissions. While there is much room for further refinement and improvement, the measures announced set a precedent for the UK and provide a very useful starting point for future reforms. Equally welcome was the Government's commitment to reform the tax treatment of company cars. However, it is regrettable that this will only come about in 2002 and urges the Government to bring forward this timescale as soon as possible.

Chapter 9 - The Way Forward

As stated previously, there should be a continuous assessment of trends and measures to achieve stable objectives. Formal review of the objectives themselves should be initiated specifically in the light of these and in close consultation with the Air Quality Forum. However there is some concern that, according to paragraph 369 *"The content of the next review of the Strategy is already taking shape"* which does somewhat pre-empt the results of both the current consultation and the process of setting the agenda for the next review. The Government should consider, and we would welcome a dialogue on the following:

i. The emphasis for the next review of the Strategy should be to assess the measures which can meet the objectives then in place, rather than setting objectives which can be achieved by current measures. This should be the overriding principle of the review.

ii. In line with the principles of open government, the Government should seek views on the process for monitoring progress in achieving the UK objectives, including its balance and agenda. This could be carried out through the Air Quality Forum and would greatly assist in the optimum allocation of resources and research funding.

iii. The work carried out by NETCEN and others in providing the technical basis for the review is greatly appreciated. However, there is a great deal of knowledge in the air quality field which exists in other organisations, companies and institutions. Given the complex and difficult nature of the air quality problems which face society, it would be advantageous to tap as much of this knowledge as possible in carrying out the next, and subsequent, reviews. Therefore, we urge the Government to set up a National Air Quality Technical Forum, either in parallel to or as a sub-group of the Air Quality Forum.

iv. Paragraph 370 suggests that the UK air quality monitoring network is to be expanded in the next few years. While this is a welcome development and one which NSCA encourages, it will commit large amounts of both central and local Government resources. In order to ensure these resources are utilised in the most effective manner, the Government should produce a national monitoring strategy. This strategy should address the needs of both urban and rural monitoring and should prioritise the placement of monitoring equipment and the pollutants to be monitored. Such a strategy would be highly valuable to local authorities looking to expand their monitoring capabilities. It should also include a strategy for the public dissemination of data collected, both nationally and locally.

Local authorities will be in a position to develop LAQM action plans before the next review is finalised. Indeed, many are already developing local transport plans which must have a substantial part given over to the improvement of air quality. Therefore, there is an urgent need for the Government to assess the expected benefits to urban air quality which can be achieved by implementing the measures set out in both this review document and the Transport White Paper. Only when these potential benefits are understood can local authorities assess the possible improvements to local air quality which could be made by their action plans and air quality strategies.

THIRD CONSULTATION PAPER ON THE IMPLEMENTATION OF THE IPPC DIRECTIVE

Introduction

NSCA welcomed the opportunity to respond to the IPPC implementation 3rd consultation paper. The Society particularly welcomes the way in which the consultation is being handled, through a series of four structured and sequential consultation stages, which it believes allows the complex issues to be considered in a systematic and considered way.

This consultation paper covers a first draft of the regulations. The Society represents a wide range of regulatory bodies and industrial companies, who will be closely affected by the legislation. Having had the opportunity to follow the legislative proceedings so far, and in particular consider the report of the Committee on Statutory Instruments, it remains the Society's view that the model adopted by the Government - broad enabling powers with detailed regulation-making powers subject to negative resolution - is an appropriate way to deal with systems and procedures as broad and complex as those which will be entailed by this legislation.

Regulatory Bodies

The Society believes that the decision to retain both the Agency and local authorities as regulatory bodies under the legislation is sound. It will not be possible to offer a considered view until the detailed allocation of industrial sectors between the two regulatory bodies is made known in the next consultation paper, but the implication that the allocation would be based on a careful and pragmatic review of the circumstances of each industry must be sensible. The Society believes that this will result in a substantial continuing role for local authorities, which it believes to be very important to the long-term health of environmental management in the UK.

While this is a sensible decision now, however, the Society is on record as believing that before long the overall structure and functions of the Agency will need to be re-examined, partly in the light of the increasing importance of the regional level of administration, and partly to ensure a more generally appropriate relationship with local government. Further, there is increasingly a clear need to review the links between the planning system and the environmental protection system, in terms of both their objectives and procedures. Ideally this question should be addressed in the course of implementing IPPC. If that is not possible, it is important that the issue should be addressed at the first subsequent opportunity, and that decisions taken now for immediate implementation purposes, should have this in mind and, so far as practicable, prepare the ground for it.

On a more general note, the structures and procedures for local authority/Environment Agency communication need to be firmly in place well before the introduction of IPPC. The *Environmental Protection Act* enforcement regime requires a certain amount of "statutory consultation" between local authorities and the Agency and there are instances of local cooperative arrangements for some authorised processes. However, the former is an informative rather than a consultative process and the latter only developed on an ad hoc basis. IPPC will require communication on cooperation for day to day enforcement issues, most notably in the areas of water and noise pollution prevention. Unless there is an agreed and working system for ensuring that this happens, IPPC will prove difficult to implement "on the ground".

It is noted, however, that responsibility for animal rendering plants will be moved from local authorities to the Agency. This seems entirely appropriate, having regard to the range of environmental impacts of these plants, their small number and their specialised character.

Better Regulation Issues

Public consultation (para 27)

The Society agrees that the full public consultation procedures should not be required in the case of applications which have no substantial impact on the environment, unless there are special considerations making them of special interest. However, the Government should exercise caution in this area; in the absence of strict guidance on "triviality" there is scope here for the creation of substantial grey areas. A potential result is that the local community has little opportunity to comment on a processes with a marginal but locally obvious environmental impact. This would undermine local accountability and democracy.

Review period (para 28)

The Society welcomes the criteria proposed for determining the period for review of permits for the different sectors. It is clearly sensible that these should reflect the different circumstances of each sector.

Standard application forms and standards (paras 40 and 42)

The Society welcomes the proposal to move to standard applications forms, and with the proposal that account could be taken of submissions and other regulatory provisions. In the case of standard permit conditions, the Society has no specific sectors to suggest. Rather it takes the view that certain standard conditions are likely to be relevant for almost all regulated sectors, and that all sectors should be reviewed on that basis.

Implementation Issues

Discharges to water (paras 53 and 54)

A consequence of the decision to retain both the Agency and local authorities is that the Environment Agency may need to have some role in those authorisations by local authorities which include a discharge to water. While the Agency, it is proposed, will be a statutory consultee for all applications considered by local authorities, it is suggested that, for discharges for water, the Agency should be given powers to 'insist on the inclusion of specific conditions', or conditions to meet minimum criteria. The consultation paper seeks views on whether the Agency should only be allowed to specify minimum criteria; or be able in addition to specify stricter consideration which it believes corresponds to BAT as a whole; or such conditions corresponding to 'BAT for water'.

The Society believes that, if the local authority is to be able to exercise its responsibility to judge the best integrated permit conditions, it would be appropriate that the Agency be able to insist only on minimum criteria, even though that would of course leave it free to argue separately for going beyond it, considerations on which in many cases the local authority will no doubt wish to act. In the Society's view it would be inconsistent for the Government to make local authorities the authorising body, and then, for authorisations of this kind, bind their hands to the extent that is implied by the second and third options. These options would also have a detrimental effect on the local accountability of permits and of action taken to enforce such permit conditions.

Control of noise (para 54)

The issue which has provoked the greatest concern among NSCA members is that of noise and the implications for control generated by the IPPC regime. NSCA welcomes the Government's commitment to cause 'as little disturbance as possible' to existing arrangements under the statutory nuisance provisions of the *Environmental Protection Act 1990*. However, it is not persuaded that the arrangements proposed by the Government are satisfactory or, indeed meet this objective.

Given that, on the whole, noise expertise resides with local authorities, it is clearly right that the Environment Agency should be under a duty to consult them. It is indicated that guidance will then require the Agency to accept the local authorities' request for permit conditions, or to explain in writing why the conditions would be inappropriate. In the Society's view this is far too weak, and sits uncomfortably beside what is being proposed in the parallel case of the water components of local authority authorisations. In the NSCA's view, the Agency should be required to include the local authority's proposed permit conditions, unless it can demonstrate that adoption of those conditions would so impact upon other provisions of the authorisation as to prevent the Best Practicable Environmental Option emerging.

More generally, NSCA is not persuaded that the Government has adequately thought through the way in which noise is handled. In particular, there is doubt as to whether it is appropriate to rely on BAT in the way proposed. The debarring of local authorities from taking nuisance enforcement action for any IPPC installation will give rise to a number of practical complications which, in reality, would mean a lower standard of protection than is currently the case.

For example, how will the emission limit for noise from an IPPC installation be derived? Of all the pollutants covered by the IPPC regime, noise is the most variable and therefore subjective, in nature. There is, as yet, no satisfactory general standard which adequately deals with tonal or intermittent noise and the huge variety of processes to be regulated will mean such a generalised standard will be extremely difficult to develop.

This leads on to the question of what action should be taken if a nuisance does arise from an authorised installation. Unless the concept of nuisance is incorporated into the definition of noise under IPPC, it is entirely conceivable that a nuisance could occur in addition to BAT being complied with. This is aside from the question of whether the noise is emitted from the operation or from an associated part (e.g. loading or unloading of feedstock, product or waste, malfunction of on-site ancillary equipment such as air conditioning, burglar alarms, etc.) which may not be covered by the authorisation or by any BREF notes.

The consultation paper also implies (para 56) that the current system of noise enforcement does not allow proactive action to reduce noise. However, both nuisance legislation and the land use planning system provide mechanisms for just this type of action, through abatement notices and conditions attached to planning consents, respectively. Added to this is the somewhat ponderous, when compared to nuisance, enforcement system for IPPC which will further degrade the level of protection offered to the general public in terms of noise.

NSCA believes that there is a strong case for retaining the concept of nuisance within IPPC, either by allowing the enforcement of nuisance under the *Environmental Protection Act* or incorporating it into the definition of noise under IPPC. The Society is not persuaded that the risk of 'double jeopardy' is a sufficient ground for disbarring procedures under nuisance legislation where there is a prior authorisation on the basis of BAT. Elsewhere the Society has argued that a general review of environmental noise policy is now required. Any decision to circumvent the nuisance legislation should await the outcome of that review.

Odour Control

The Society welcomes the proposal in the consultation paper which makes clear for the first time that controls on odour can be a dimension of an integrated permit.

New Permit Conditions

The consultation paper gives for the first time significant clues to the Government's thinking on the way in which the new powers within the IPPC Directive to incorporate conditions in respect of energy efficiency, site restoration and waste management, are to be tackled. In all cases the Government has in its proposals so far taken a generally modest, not to say minimalist, stance. Given the tight timetable and the complexity of the overall process, this is understandable. It is however only defensible in circumstances where a broad regulation-making power will leave the option quickly to develop these areas further to ensure that the new powers open up the environmental benefits for which they were designed.

This is particularly important in the case of energy efficiency. The Society believes that over the next few years it will be necessary to reduce radically unnecessary energy use, if carbon dioxide and other environmental objectives are to be achieved. The IPPC provision represents an important instrument for securing that. While there is a case for relying, as proposed, simply on 'site-specific permit conditions based on best technologies and bench-marks of cost-effective energy efficiency developed by ETSU', there is a strong case for allowing the option of promoting relatively demanding BAT standards in energy efficiency in the areas where this is possible. The Society believes that, if Departments are to proceed for the present on the basis they propose, this should nevertheless be complemented by work on how a more imaginative and environmentally positive use of these provisions could be secured.

UK CLIMATE CHANGE PROGRAMME

In late 1998, the Government published its proposals for meeting its manifesto commitment of a 20% reduction in carbon dioxide emissions by 2010 based on 1990 levels, as well as its commitments under the Kyoto Protocol agreed in December 1997; this latter commits the EU as a whole to reduce its emissions of six greenhouse gases by 8%, also based on 1990 levels, between 2008-2012. To enable the EU to meet this target, the UK agreed in June 1998 to reduce its emissions by 12.5%. This consultation paper sets out the changes which need to be made to bring about reductions in carbon dioxide emissions and the benefits these will bring in the form of better insulated homes, more fuel efficient and competitive industry, better public transport system, and business opportunities in the global environmental technology market.

Introduction

NSCA's membership - environmental specialists in local authorities, industry and consultancies - has two overall concerns for national policies designed to reduce greenhouse gas emissions. Firstly, they must complement other environmental policy objectives - for instance local air quality objectives - as far as possible. Secondly, the social and economic impact of climate change policies must fall on those sectors of society and the economy most able to bear them. Within that context, the Society's specific comments relate to the sectors in which it has most experience: transport, industry and the domestic sector. NSCA's comments also look at the general framework for climate change policy in the UK.

General Comments

The Society welcomes the increasing importance which the UK Government is giving to climate change issues, and to the improved international profile adopted by the UK in negotiations at EU and international level. To some extent the UK's ability to meet CO_2 targets has been underwritten by a shift in generation mix which is unlikely to be continued. Further measures to combat greenhouse gas emissions will need to address issues of energy demand directly. On the supply side, much more positive action will be needed to meet the target of 10% renewable contribution to power production by 2010, and to promote the use of combined heat and power plant.

On a broader timescale, it is clear that the current and projected patterns of global use of non-renewable energy sources are unsustainable, particularly if questions of global equity are considered. The UN Intergovernmental Panel on Climate Change calculates that a global cut of 60% in greenhouse gas emissions is required by about 2050 - and the UK might be expected to take a larger share of such reductions, given its higher levels of fuel use per capita. Although objectives for 2010 are important, a substantial reduction in the energy intensity of the developed world will take much longer to achieve, and choices made today will affect trends in energy consumption well beyond that date. Whilst we welcome the consultation paper's sectoral assessment of current and possible future policies, a series of more ambitious measures, aimed at more challenging longer-term targets, would also have been valuable.

Projections of the possible impacts of climate change and the policy options to reduce emissions of greenhouse gases have been understood for some time now. Whilst we welcome this consultation paper, it represents another round of consultation at a time when many no-regrets policies could have already been implemented and some more far-sighted programmes commenced. Furthermore there is a marked reluctance to implement measures which may be viewed as politically unpopular - especially in relation to transport policy. The Society hopes that the Government will achieve a better balance between action and words in the near future.

Whilst there is a need for more urgency at national policy level, we believe that there is considerable scope for improved targeting of action at local level. When local authorities are given the duty to promote the economic, social and environmental well-being of their areas (proposed in the recent White Paper on Local Government), they will be empowered to take on a more active role in promoting energy efficiency among local industry, commerce and businesses - particularly SMEs - and in the domestic and transport sectors. We encourage the Government to lay the foundation for this potentially important role by incorporating the duty into the Local Government Bill currently before Parliament.

Industry

The forthcoming IPPC regulations offer an important opportunity to encourage more energy efficient processes in major industrial plant. Major processes authorised by the Environment Agency and SEPA may already be working close to optimal energy efficiency, but as plant are upgraded there may be scope to require the adoption of more energy-efficient processes, particularly when the lifecycle assessment of energy use is considered, rather than simply point-of-use. When granting and upgrading process authorisations, the agencies should give more consideration to what factors in energy use represent the BPEO; this will require the development of staff expertise in energy efficiency.

Processes currently authorised for Local Air Pollution Control should also be subject to requirements to assess and reduce energy use (and thus limit emissions of CO_2) in future upgrading plans, with indicative emission standards included in process guidance notes.

The introduction of environmental management systems should result in the identification of energy-saving measures across industry; other mechanisms to encourage energy auditing and spreading best practice should be developed. Local authorities should be encouraged to take a more active role in promoting EMS to local industry and business, possibly in partnership with local private sector mentors.

Transport

In the transport sector there is a genuine danger of conflict between measures designed to improve local air quality and climate change policy. A number of vehicle fuels/technology combinations which are relatively cleaner in air quality terms may have hidden environmental impacts. Improvements in fuel quality may be achieved at the expense of increased greenhouse gas emissions at the production or distribution stage, and it is important to consider a lifecycle assessment of various options. In the case of biofuels such as biodiesel there may be wider environmental consequences. NSCA has recommended that an automotive fuel mix study be undertaken for the UK, to advise on the environmentally optimum use of fossil and other fuels.

Whilst improvements in vehicle design and emission control have successfully reduced tailpipe emissions of the 'classic' air pollutants, current policies have patently failed to influence CO_2 emissions. Average new car fuel consumption has remained virtually unchanged for over ten years, and it is clear that the promised escalation of fuel duty, on its own, will not secure a major shift in vehicle choice and use. Nor will it encourage manufacturers to introduce highly fuel-efficient vehicles for which the technology is already demonstrably available.

Vehicles purchased today will continue to influence emissions for ten years or more. The voluntary agreement between the European Commission and car manufacturers is a welcome first step, but further measures to favour more fuel-efficient designs will be necessary. In the UK this could include a steeply-rising scale of vehicle excise duty and a more stringent use of taxation measures designed to influence company car choice and use.

On the latter point, we welcome the increase in scale charges for fuel for private motoring as an interim measure. Consideration should be given to setting an absolute maximum for free fuel use. We believe that the current scheme for fuel and car scale charges is widely abused, and any company wishing to offer company cars and free fuel should be required to audit mileage in a standard format and make returns to the Inland Revenue.

Whilst technical improvements to vehicles can deliver some reductions in CO_2 emissions, management measures to reduce the use of vehicles will be equally important, and are more likely to deliver other environmental benefits. The Government has promised a number of measures in its Transport White Paper, but these have yet to be delivered. NSCA is concerned that some voices in Government see environmental issues - particularly those relating to private car use - as a political liability, and that important policy measures are being withheld as a result. We believe that there is in fact widespread support for measures which will tackle air quality, noise and congestion, and that the Transport White Paper policy proposals should be given a fast track. The key objectives should be to reduce overall the need to transport people and freight where possible, and to effect a shift towards more sustainable modes of transport. The new framework for Local Transport Plans could include an assessment of their contribution to reducing CO_2 emissions.

Domestic

Reductions in the real price of domestic energy have brought benefits to society as a whole and to those on low incomes in particular. However it has removed much of the incentive for householders to minimise their use of gas and electricity. It is a well-understood paradox that for those most able to invest in energy-saving measures, energy bills are a minor budget item, whilst those most likely to benefit financially, and in terms of improved comfort, from more energy-efficient homes and appliances, are least able to invest. In the long term, the Government must signal its intention to tax energy at a rate which reflects its external cost to the environment. However there will be a transition period when those least able to afford energy must be insulated - financially or literally - from such policy measures.

The overall thermal performance of the UK housing stock is extremely poor. Even new buildings are built to Building Regulation insulation standards that are inferior to most northern European countries. The turnover of the housing stock is currently at a very low level. At local authority level, a major effort is required to identify those houses with the worst energy performance, by making the requirements of the Home Energy Conservation Act address-specific. A national programme of home insulation could then target the worst buildings. In some cases it may make more sense to demolish and rebuild houses with particularly poor SAP ratings.

In the case of lights and appliances, we welcome the market transformation initiatives currently under way, but it is clear that only a mix of consumer information and fiscal measures are likely to change purchasing habits significantly. This should be underpinned by regulating for minimum performance standards for white and brown goods, so that the most inefficient models are rapidly eliminated from the market. For white goods, research by the Consumers' Association shows that there is considerable disparity between manufacturers self-assessed claims for the EU energy label, and actual product performance; we believe that the energy label should be subject to independent verification.

Where particular products have a clear environmental advantage - for instance, compact fluorescent light bulbs - consideration should be given to fiscal incentives to improve their uptake. In the case of CFLs further improvements in design would also assist uptake.

NSCA Scotland

SUSTAINABLE DEVELOPMENT IN ACTION

Around 100 delegates attended NSCA Scotland's Seminar in the Moat House Hotel in Glasgow on 15 February. Speakers representing the Government, SEPA, COSLA, local authority and NSCA presented their views and experience to date with progressing and putting into action Sustainable Development. This report was prepared by June Ross, member of NSCA Scotland.

Integrating Sustainable Development

Unfortunately Lord Sewel, Scottish Office Minister for Agriculture, Environment and Fisheries was unable to present his paper due to parliamentary commitments. Jeff Pearson, attending on behalf of the Minister, and who leads the Sustainable Development Team in the Scottish Office, emphasised the Minister's and the Government's commitment to ensuring that sustainable development is a cornerstone of all social, economic and environmental actions. These actions were not to be taken in isolation of each other but together and put into practice as a whole. The way forward for sustainable development lay with the environment and thus it was important to encourage people to think about their actions, their impact on the future and to change their way of doing things in a way which benefits the environment. He suggested, however, that one of the difficulties of sustainable development is that we will probably never know if we are achieving it. Thus the delivery of sustainable development can be achieved by using a variety of tools, including:

- regulation, e.g. the control of specific discharges and pollutants;
- social development - where people's attitudes are changed so that they start to think about the consequences of their actions and take steps to change them;
- reduction in energy use, by tackling poorly insulated and inefficiently heated homes; this could be tackled within the "social inclusion agenda".

In practice, action on all these issues will be required to ensure the achievement of sustainable development.

Mr Pearson reminded delegates that in early February all Scottish local authorities had been sent a copy of *Changed Days*, a report outlining what each of the 32 LAs is doing as regards their Local Agenda 21 commitments. He noted that powers for sustainable development will be devolved to the Scottish Parliament and that at the moment there is no organisation charged with the delivery of sustainable development. He concluded his presentation by advising that there are no quick fixes in achieving sustainable development and that simple actions could take us a long way forward. Regulation and persuasion should be complementary tools and that action was needed now not at some time in the future.

Putting Sustainable Development into Practice

Tricia Henton, Director of Environmental Strategy for SEPA, looked at how sustainable Development could be put into practice. She said that it was to be welcomed that sustainable development has now become more widely recognised - ten years ago it was only a conceptual idea but today it now forms the framework for policy development across all areas of government and agencies. She suggested that sustainable development should be seen as the integration of economic prosperity, environmental protection and social equity, with each of these parameters having equal status; she pointed out that it is a truly global issue with action being taken through policy and strategy, corporate governance, regulation and controls, raising awareness through education, influence and tailoring its message for each audience.

The role of central government, local government, government agencies, NGOs, academia and the business sector were outlined in her paper in which she highlighted current practices and policies targeted at bringing sustainable development policies to the fore and areas where more work was required.

In conclusion, she said that there was an increasing level of activity in Scotland as the different sectors try to understand what sustainable development means to them. There is much to be done in raising public and professional awareness of problems, let alone how they might be addressed. It is a slow, complex problem that needs to be tackled on a multifaceted and functional basis to achieve 'joined up thinking' if we are to make progress, The actions of the major players was an encouraging start on what must be regarded as a journey not a destination.

Working in Partnerships

Bob Christie of the Convention of Scottish Local Authorities also referred to 'joined up thinking' and of sustainable development being turned into joined up action in his presentation entitled "Working in Partnerships". As advisor on Local Agenda 21 issues, he outlined the partnerships formed by Scottish local government to promote Scotland's response to Agenda 21 at local, regional and national levels, and summarised the needs, examples, gaps and opportunities for effective action with our partners. As 60% of the actions contained in the Global Action Plan for Sustainability, adopted at the Rio summit in 1992, are for local governments to act upon, people in every aspect of their lives must be involved and this links community actions to national directions. Partnerships at a National level - e.g. SNH, Scottish Enterprise, Highland and Islands Enterprise, SEPA, FOE and Forward Scotland through their sustainable community programmes, were highlighted, as were the local partnerships consisting of local authorities, health boards, local enterprise companies, utilities, major employers and, last but not least, the Community Councils which are a potentially huge partnership base.

Local opportunies for building on existing partnerships are likely to be strengthened by the proposed Community Planning policy which is expected to feature in the next Queen's Speech. Social Inclusion must play a key role along with rural partnerships and health improvement policies. Strategies for housing, economic development, biodiversity issues associated with aforementioned pressures, linked planning, transport and air quality measures should all be opportunities for achieving sustainable development with all of these issues being joined up to make links in people's lives.

At grass roots local level, active partnerships with schools, colleges, churches, wildlife trusts, amenity groups etc can be formed to promote safe routes to schools, recycling initiatives, etc. Examples of such partnerships were highlighted, along with examples of in-house action such as in improved energy usage, waste minimisation, sustainable purchasing etc.

Mr. Christie concluded his paper by suggesting that with the new Scottish Parliament coming into being it was perhaps time for forming new partnerships with the new parliament, new councils, public bodies, business and the voluntary sector, bearing in mind that there are only 685 days until we reach the Local Agenda 21 target!

The Role of Local Authorities

Kenny Boag, Environmental Policy/Waste Strategy Officer with South Lanarkshire Council and Chair of the Scottish Local Agenda 21 Co-ordinator's Network examined how sustainable development and the Local Agenda 21 process are rapidly becoming essential tools in a local authority's strategic and operational portfolio. He said that partnerships, community involvement, future planning and integration of services are considered to be the four main principles of sustainable development. Partnerships in the present climate of decreasing financial resources within local authorities are not only essential but should be viewed in an extremely positive sense as no single agency could address all the issues on its own. Similarly, consultation and engaging community councils in any decision making is essential if communities are to assume their role in the process; local people have to accept that their long term quality of life requires some sacrifices and difficult decisions on their behalf if sustainable development is to succeed.

He gave some illustrations of partnerships and projects in action. In particular, he described South Lanarkshire's Home Energy Conservation Strategy; this programme linked energy efficiency with health to represent the interests of the most vulnerable groups, i.e pensioners, low income families, etc, for whom energy efficiency can be a matter of life and death. Partnerships were formed with the health authorities, local suppliers, DIY stores, community groups etc and the local community involved via a survey, awareness campaigns, and educational material. Local schools took part in competitions; planning and building services in the Council incorporate energy efficiency requirements in the planning and building warrant procedures giving out advice etc. Operation Spotlight targetted litter and waste problems - this involved partnerships with the police, SEPA, Scottish Office, Railtrack, Keep Scotland Beautiful, local press, radio and TV. Communities were involved in educational initiatives, leaflet campaigns, practical events, local surgeries etc. Youth organisations have been targetted and on going communication has been achieved by the establishment of forum groups.

Mr. Boag concluded his presentation by agreeing with previous speakers that there is no one simple answer to how to achieve sustainable development. In broad terms he sees the role of local authorities as one in which they use sustainable development and the local agenda 21 process to build safe, secure and healthy lifestyles for the communities they serve both now and in the future.

Sustainability and the Voluntary Sector

The final speaker of the day, Richard Mills, NSCA Secretary General, looked at sustainability and the voluntary sector from an NSCA Perspective. His presentation focussed on two questions:

- How can sustainability become the unifying theme for environmental groups and other voluntary bodies for looking at environmental and social developments; and
- What, in turn, should be the role of voluntary sector bodies in facilitating progress towards sustainable development.

He said that the Society's role had primarily focused on tackling the major historical problems of air pollution but that now it is also the main NGO addressing noise issues and other prominent environmental functions, increasingly diversifying into general environmental issues. He focused on NSCA's work on the Air Quality Strategy and on incineration; in noting that today the environment is often seen in terms of general quality of life rather than in terms of specific environmental aspects of pollution control, he said that increasingly social, economic and environmental concerns had to be taken into consideration on any policy addressing specific environmental problems.

He saw the role of voluntary bodies as including consensus building - promoting a broader public consensus on the objectives of sustainability; galvanising action by acting as a forcing house for progress; sustainable living encouraging actual changes in practice. Finally he outlined NSCA's priorities for its second century (see separate article in this issue of Clean Air), confirming that sustainable development will be a keystone for the future, remaining a central focus for all its policies.

Copies of the papers, overheads and extracts can be obtained from Clare Carruthers by telephoning 0141 287 6530, fax 0141 287 6505.

Members News

Members! Are we covering your news? Please check that your press office has *Clean Air* on its mailing list.

Several of NSCA's corporate members were shortlisted for the UK Environmental Reporting Awards this year, organised by the Association of Chartered Certified Accountants (ACCA). These included **BP, British Airways, ICI,** and **Eastern Group**, who were the runners-up. Eastern earned particular praise from the judges for their approach to reporting eco-efficiency and sustainable development. The overall award went to Anglian Water. Contact: Roger Adams at ACCA, 0171 396 5971.

A school in Bexley has used an emissions spreadsheet produced by NSCA to calculate pollution caused by journeys to school. The project was demonstrated at a Youth Environment Conference organised by the **London Borough of Bexley** as part of their LA21 Action Plan. Information from Linda Davies, 01322 550427.

Croydon Council is challenging local schools to come up with energy-saving ideas, and promises to back the best ones with £1,000 of investment if the

proposals can save £200 a year in energy costs. Pupils will be analysing fuel bills, measuring temperature, and conducting experiments with the help of a consultant engineer. Contact: Don Garman on 0181 655 2014.

Shell is now selling its ultra-low sulphur Pura diesel at 80% of its service stations, following a successful launch at 140 sites within the M25 last October. Customer service line: 0800 731 8888.

Bristol-based **Air Quality Consultants** and **University of the West of England** have jointly been awarded a DETR contract to review all the documents produced by local authorities as part of their air quality management duties. The partnership will also set up a help desk to provide advice, backed by information on a website. Email address: ‹aqm-review@uwe.ac.uk›

The **City of Westminster** has been designated the UK's first Air Quality Management Area, following a decision by the Environment and Planning Committee. This follows an air quality review which showed levels of nitrogen dioxide and particles would fail to meet the National Air Quality Strategy objectives for the year 2005. The Council has already taken a number of measures to tackle pollution through its Clean Air Campaign. Website: www.westminster.gov.uk

London Borough of Sutton is maintaining its commitment to electric vehicles by purchasing four Citroen Berlingo electric-powered vans for its Meals on Wheels service. Sutton is the lead UK member of the European ZEUS consortium, which aims to encourage the development of infrastructure for zero and low emission vehicles. Last year the Council opened the UK's first public recharging point in a multi-storey car park. Motorists can charge up for free - but they still have to pay for the parking place! More info: Richard Barnes on 0181 770 6246.

Divisional News

The **West Midlands Division** braved torrential rain and a sea of mud to tour the new Rugby Cement works at its last meeting. They discussed implementation of IPPC, air quality and local environmental management issues, and set venues and dates for future meetings: Walsall - 13 April, Redditch - 13 July and Birmingham - 12 October.

The **East Midlands Division**'s latest visit was to Melton, where members were given a presentation on contaminated land by Pick Everard Consultants. There were also presentations on two local industrial processes, followed by site visits, to Pedegree Masterfoods manufacturing plant, and Holwell Foundry. Our photo shows the speakers and representatives of Melton Borough Council, the hosting authority.

Meanwhile, Environment Minister Alan Meale MP will be the guest of honour at the Division's centenary celebration lunch later this year.

Members were saddened to learn of the death of Ken Enderby, for many years the Chief Environmental Health Officer at Peterborough, and a past Chairman of the East Midlands Division. Ken was active in the Society for more than 30 years and was made an honorary member in 1991.

Members will have also read of the recent death of Lord Yehudi Menuhin, Lord Menuhin, who joined NSCA in 1964, had a lifelong interest in environmental issues and in 1976 took delivery of the first Transformer 1 electric car to come England. He used the car for his daily activities around London and said at the time that "driving a pollution-free car powered by electricity rather than petrol represents a contribution on his part to a cleaner environment not dependent on dwindling world supplies of petroleum".

Lord Menuhin pictured in 1976 with his electric car, Clean Air, vol. 6

FORTHCOMING NSCA EVENTS

Thursday 27 May
Workshop - London
UK Dispersion Model Users Group

Thursday 24 June
Training Seminar - NEC Birmingham
Air Quality Management

Tuesday 14 September
Training Seminar - NEC Birmingham
Noise Update 1999

Monday 25 to Thursday 28 October
Annual Conference and Exhibition - Brighton
Environmental Protection 99

November
Training Seminar - NEC Birmingham
Air Quality and Health

Thursday 25 November
Workshop - London
UK Dispersion Model Users Group

Tuesday 15 February 2000
Training Seminar - NEC Birmingham

Monday 23 to Thursday 26 October
Annual Conference and Exhibition - Scarborough
Environmental Protection 2000

For further details please contact
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ENVIRONMENTAL PROTECTION 99

Global Issues, National Policies, Local Action

- Environmental Priorities for a New Millennium

Special NSCA Centenary Conference
13th IUAPPA Regional Conference

Monday 25 to Thursday 28 October 1999
Brighton Conference Centre

Conference Sessions

Transboundary Air Pollution

Problems and Progress in Air Quality Management

Managing the Local Environment: Developments in Policy and Practice on Noise, Waste Management and Land Contamination

Issues in Energy and Industrial Regulation

Integrated Product Policy

Invited Keynote Speakers

UK Environment Minister

Sir John Houghton, formerly Chairman, Intergovernmental Panel on Climate Change

Jan Thompson, Chairman, Convention on Long Range Transport of Air Pollution, Norway

Exhibition and Social Programme

Conference Fees - Early Bird Registration (to 30 September)

NSCA members Full Registration - £280.00 + VAT

Non-members Full Registration - £360.00 + VAT

Conference Fees - from 1 October

NSCA members Full Registration - £295 + VAT

Non-members Full Regisration - £385.00 + VAT

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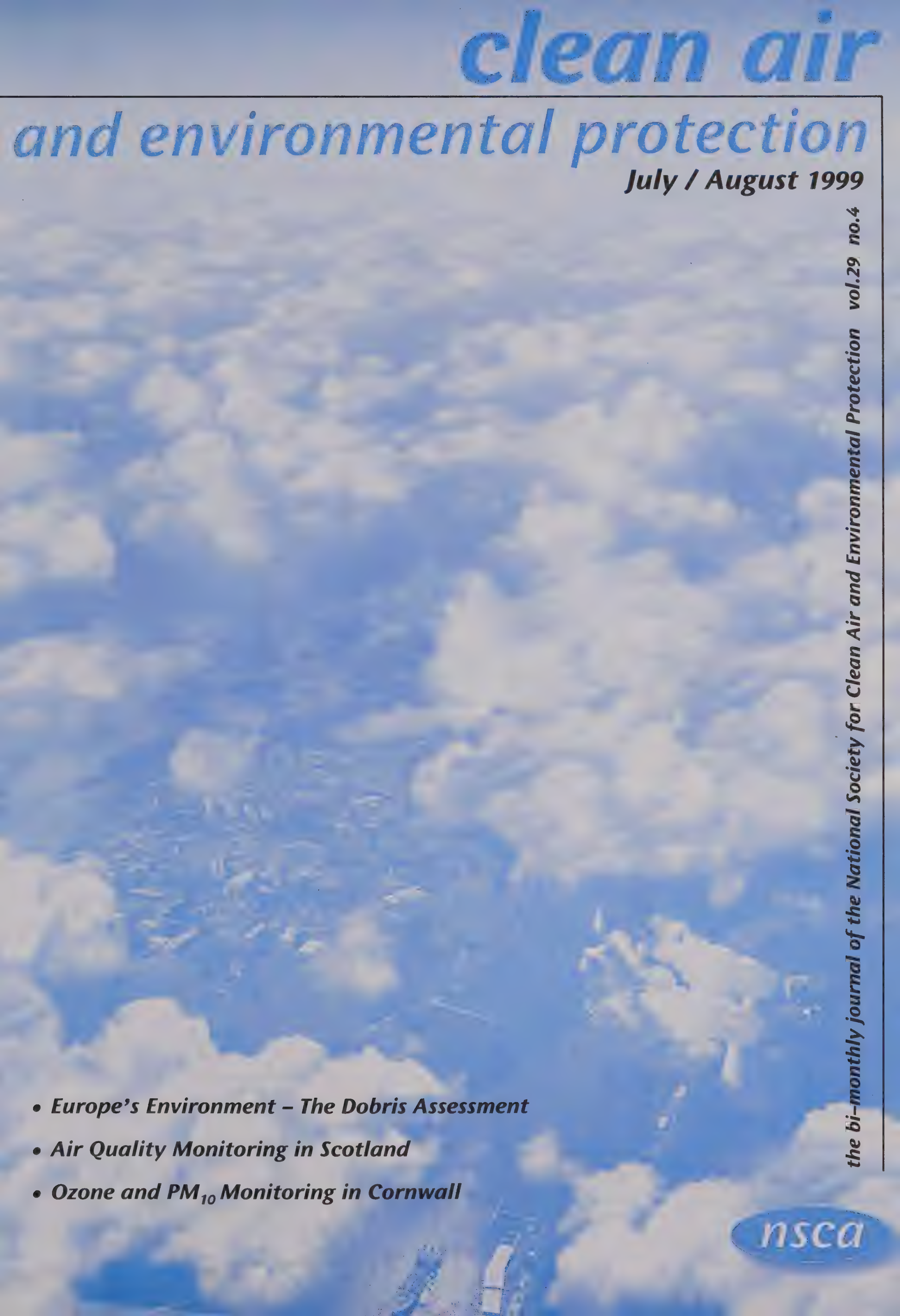

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- Europe's Environment – The Dobris Assessment
- Air Quality Monitoring in Scotland
- Ozone and PM_{10} Monitoring in Cornwall

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Conference Sessions

Climate Change, Lecture by Sir John Houghton
Regional Air Pollution Issues
Environment and the Countryside
Managing Air Quality: Taking Stock of Progress
Building Sustainable Communities
Managing the Local Environment
Industry, Energy and the Local Environment
plus comprehensive Parallel Technical Sessions

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Environmental Protection Exhibition 1999

Please contact Howard Phillips at Turret RAI, tel: 01895 454546 for detailed information

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The National Society for Clean Air and Environmental Protection produces information, organises conferences and training events, and campaigns on air pollution, noise and environmental protection issues. Founded in 1899, the Society's work on smoke control led to the Clean Air Acts. More recently NSCA has been influential in developing thinking on integrated pollution control, noise legislation, and air quality management.

NSCA's membership is largely made up of organisations with a direct involvement in environmental protection: industry, local authorities, universities and colleges, professional institutions, environmental consultancies and regulatory agencies. Individual membership is also available to environmental specialists within industry, local authorities, central government, technical, academic and institutional bodies.

Members benefit from joining a unique network of individuals who share an interest in a realistic approach to environmental protection policy; from access to up-to-date and relevant information; from reduced fees at NSCA conferences and training events. They contribute to NSCA's regional and national activities; to environmental policy development; to translating policy into practice; to the Society's wide-ranging educational programmes.

NATIONAL SOCIETY FOR CLEAN AIR AND ENVIRONMENTAL PROTECTION

(Founded 1899)

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Editorial

Municipal Waste to Energy: Friend or Foe?

Waste disposal is, without a doubt, one of the most contentious issues in the environmental field. It is also the issue where the greatest number of environmental concerns come together, touching on resource use, land contamination, water quality, air quality, climate change, land use, noise, odour and local amenity issues.

The production of waste has long been seen as an inevitable by-product of civilisation and in many ways the amount of waste produced is a marker of the success and wealth of society. However, our society is reaching a crisis point in terms of waste disposal; the traditional option of landfill is becoming less and less viable as the number of sites decreases and public opposition to new ones increases. This and the rising cost of landfill has forced us to look more closely at the alternatives in an effort to define the best option for municipal waste disposal.

In theory, virtually all domestic waste arisings can be either reused or recycled. However, of all the different elements of domestic waste, the only ones for which there is a genuinely sound environmental and economic basis for recycling are metals (particularly aluminium) and glass. While markets do exist for other recycled products, such as plastic and composted organic waste, they tend to be sporadic and supply cannot always be guaranteed.

Waste incineration, with electricity generation, has been put forward as an acceptable middle way between recycling/reuse and direct landfill. The technology has advanced some way in recent years and modern, well designed, well maintained plant can adequately control emissions of the gases most often associated with incinerators of the past. Such plant, with the correct emission control techniques, should not give rise to emissions beyond those to be expected from any large combustion plant.

The incinerator site can also be used as a focus for recycling with dedicated areas for various waste streams and pre-screening of waste for aluminium and steel. In addition, composting biodegradable waste both increases the recycling levels for the area and improves combustion control at the facility by reducing the water content of the feedstock.

This shows that waste to energy can give a net benefit if it is efficient and well run and if it is fully integrated into a strategy which includes a progressive recycling scheme and it is certainly less harmful than direct landfill. However, it has been argued that the capital investment needed for an incinerator could block the development of more environmentally benign methods of waste treatment. The Best Practicable Environmental Option for local or regional waste disposal is still unclear and incineration should always be viewed in the context of an environmentally sound and practically feasible waste management strategy. Incineration is often given a wholly negative status, which it probably does not deserve, and what is needed is a clear policy which strips away these perceptions and is based on sound facts. NSCA has a part to play in this process and the formation of the Land Quality Committee, whose first meeting was in May, will greatly assist in developing our position.

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NSCA's Centenary

The Trustees of the Society decided last year that the Society's Centenary should be marked by a wide-ranging programme, which reviewed the Society's policy objectives, raised its profile and strengthened its work, particularly on education, as well as enhancing its general capability to play an active role across the environmental agenda.

The last edition of Clean Air reported the Banqueting House Reception with the Prince of Wales, and the Conference at the Royal Society of Arts, 'Prospects for a Sustainable World', which formally marked the Society's Centenary. Although these will inevitably be seen as highlights, they are only part of a wider programme of special events and new developments to mark the Centenary, which continues through to the end of 1999.

This report gives a brief summary of some of the main events and developments now underway or planned.

Policy Review

To mark the Centenary, the Council approved a major policy review paper, 'Priorities for a Second Century', which was published at the time of the Centenary Conference last December, and which, after an extensive period of consultation and review within the Society, will come forward for final consideration at the Society's Annual Conference in October. The consultation draft was published in the last edition of Clean Air (May/June 1999). Members are urged to let Tim Williamson, the Society's Policy Officer, have their views and proposals, which can be taken into account in further discussion and development of the document.

A key objective of the Centenary Year is to clarify and strengthen the role the Society has already established as a broadly-based environmental group, although of course focusing in particular on atmospheric issues. In line with this, a new policy committee on land quality has been established, chaired by Prof Dame Barbara Clayton. This will oversee generally the Society's work related to land, with a particular focus on land contamination and remediation policies.

The Society is also establishing a special Award Scheme to mark its Centenary. Given the strength of the Society's links with local authorities, and its involvement in developing policies at local level, the scheme - which is described more fully below - will be for Local Authority Innovation in Sustainable Development.

Education

Among the most important objectives of the Centenary Year are to strengthen the Society's commitment to, and representation in, the educational sector. In support of this, two major projects are now underway:

- *Transport Emissions Assessment for Schools.* The Society is developing a major teaching resource, initially for schools, to help the understanding and calculation of the impact of journeys - notably the school run, but also other trips - on air quality (see also below);
- With support from the DETR's Environmental Action Fund, the Society is undertaking a two-year project to develop and distribute a major teaching pack on Noise, as the key resources for encouraging young people to understand and address an issue of increasing environmental significance (see also below).

The Society has always played an important role and presence in the academic field, and in the next few months Committees of the Society will be reviewing the ways in which our links with higher education can be strengthened, and the Society play a more active role in supporting the academic community in key areas of environmental policy. The Secretary General would welcome views and suggestions.

The Centenary in the Divisions

Through much of the Society's first century, activity in its regional Divisions, and at local level, has been an important element of its work. All the Society's Divisions will therefore be holding special events both to celebrate the Centenary in their region, and to give added impetus to the Society's work. Among those which have already taken place, or are planned, are the following:

- **Scotland:** Conference on Sustainable Development (15 February);
- **Northern Ireland:** Conference on Air Quality (13 January);
- **East Midlands:** Centenary Lunch, addressed by Alan Meale, Parliamentary Under- Secretary of State, DETR (23 April);
- **Yorkshire:** Conference on Sustainable Urban Regeneration and Development (9 June);

In addition, to recognise the particular role of London as the original home of the Society, the Corporation and the City of London will be hosting a special Reception and Exhibition for the South East Division at the Guildhall on 16 September.

Innovation in Development Acknowledging Local Authority Achievement

During 1999 and 2000 NSCA is promoting an award scheme to recognise exceptional contributions by local authorities to the promotion of innovation in local sustainable development. This scheme has been made possible by a generous grant from the UK Petroleum Industry Association to the NSCA Centenary Fund.

Purpose of the Awards

Sustainable development now features among the statutory duties of the environment agencies and Regional Development Agencies, as well as in the Government's Sustainable Development Strategy. Local authorities have already undertaken much useful work within the framework of LA21, and the Government has declared its intention to place a Sustainable Development Duty on local authorities, in terms of an obligation to promote the economic, social and environmental well being of their area. NSCA considers this an important development, and that local authorities should be encouraged to prepare for this duty and to approach opportunities to promote sustainable development in a positive and creative manner. Some have already developed innovative initiatives in this field, which merit wider recognition and need to be more widely promoted in the interests of encouraging good practice.

Scope of the Awards

It is proposed to make awards in each of the following areas:

- Sustainable Transport and Air Quality
- Environmental Health and Sustainability
- Implementing Sustainable Development.

In assessing applications, the following will be taken into account:

- Skills, originality, persistence and other qualities displayed by the development
- Effectiveness of the innovation in furthering sustainable development
- Extent to which the development is replicable elsewhere, and has wider implications;
- Process by which the innovation was developed, including the nature and extent of consultation and partnership with external interests.

The judging panels will be chaired by the NSCA President, Sir Crispin Tickell, and include the President of the UK Petroleum Industry Association and a senior representative of local government.

Application Procedures

Local authorities intending to submit applications should notify the Society by 30 June. The deadline for formal submissions is 31 July. Submissions should be in the form of an outline of the development, of not more than six pages, which should briefly describe the purposes, origins, key features and impacts of the development.

Winners will be notified in the first half of October.

The awards will be presented at the Opening Ceremony of the NSCA Centenary Conference on the evening of Monday, 25 October 1999; winning authorities will also be invited to make a presentation or contribute a display as part of the Conference. The presentations will be published in a special edition of Clean Air. For further information contact: Richard Mills at NSCA.

Low Emission Zones Project

NSCA is co-ordinating a research project to look at the potential for low emission zones (LEZs) to improve local air quality problems. The first phase of the LEZ project looked at LEZ objectives and criteria from the perspective of air quality objectives. This created a matrix of possible options with different implementation issues, which were addressed by the second phase of the research work. Although various management and enforcement measures (emissions testing, traffic reduction measures, etc) will contribute to the implementation of any LEZ, the main focus of the current project is the potential for encouraging enhanced vehicle and fuel technologies to contribute to local air quality improvement.

Since conventional petrol/diesel technology is making rapid advances through Euro III and IV standards, the question of timescale is important - there is a relatively limited window of opportunity to make early improvements to the fleet mix. Given the long lead time in fleet replacement, fleet managers need clear signals about any likely restrictions on the type of vehicles which may be used in the future. Confidence in the availability of infrastructure to supply alternative fuels, and fiscal measures to support cleaner fuels, would also be crucial.

National consistency in the criteria for establishing LEZs will benefit fleet operators, and a more flexible approach to planning restrictions on off-peak deliveries could also help to reduce congestion and spread the load of emissions. However there may be noise implications if a large number of deliveries are made at anti-social hours in noise-sensitive areas.

Depending upon an assessment of the effectiveness of various LEZ options, practical implementation issues are likely to be a major constraint on the adoption of LEZs. The key issues will be:

- adequacy of regulations and enforcement powers;
- availability of improved fuels and technologies;
- effects of access control and information systems.

This will include the issue of certifying and identifying 'cleaner' vehicles. Again, major fleet operators would benefit from national consistency in identification/certification criteria, rather than facing the possibility of a range of local permits using differing criteria.

The final report on LEZs will combine the findings of the two reports outlined above, and be launched at a conference in July, along with a local authority 'toolkit' which will include a review of LA LEZ experience, a guide to good practice in fleet management, a guide to specifying contracts for services in LEZs, and an emission calculation methodology, enabling local authorities to estimate the likely effect of various LEZ scenarios on vehicle emissions in their area. This could be used in local emissions inventories to estimate the actual impact on local air quality of an LEZ.

The Future of the NSCA Cleaner Fuels Forum

The CFF has become a very useful independent forum, bringing together interests from the oil and motor industries, retailers, freight distribution, local authorities, public transport, research consultancies and environmental groups. Following the publication of the CFF report on Low Emission Zones, there is potentially a continuing role for the Forum:

1. Continuing to monitor the use of cleaner fuels and advise on their potential air quality impacts.
2. Developing consensus on national emissions criteria for Low Emission Zones.
3. Monitoring and advising on the implementation of Low Emission Zones and other transport-related initiatives for air quality management and local transport plans.
4. Initiating research and developing consensus on issues relating to the environmental impact of cleaner fuels and fleets.

NSCA will be taking soundings from CFF members about the developing role of the Forum. Any organisations wishing to become involved with the Forum's work should contact Tim Brown at NSCA. Email:tbrown@nsca.org.uk

Noise Pollution Education Pack

Funding from the DETR Environmental Action Fund has been awarded to NSCA, for the development of an education resource on noise pollution. It is proposed to develop a resource that will:

- educate pupils about the sources, spatial distribution and effects of noise pollution in modern society;
- educate pupils about the effects that environmental noise pollution can have on quality of life for others and themselves;
- provide pupils with mechanisms by which they can assess their local noise climate;
- provide pupils with mechanisms by which they can assess their own impact on the local noise climate and consider ways of ameliorating this;
- provide pupils with mechanisms by which they can consider noise pollution and devise methods of amelioration.

Scoping work is currently underway. The pack will be researched and developed over the coming year, for publication in Spring 2000. For further information contact: Mary Stevens Email: info@nsca.org.uk

Transport Emissions Assessment Teaching Pack

Published in time to be used during Don't Choke Britain in June, this new teaching pack enables students to assess the environmental and health impacts of the journey to school. Aimed at secondary school students, this 24 page booklet covers the calculation of emissions caused by different modes of transport, the pollutants emitted, local and global issues and the use of information technology. Researched and developed by NSCA, the resource has been written and reviewed by practising teachers and educational specialists, with technical and financial support from East Sussex County Council. It has been distributed free to 1700 schools across the country, and will be launched at Seaford Head Community College in East Sussex in June.

Copies are available from NSCA at £4.00 inclusive.

Occasional Papers

The first two in the Society's new series of Occasional Papers have now been published, with the generous support of Lyondell Chemical Europe Inc. The series aims to promote wider access to key contributions to environmental science and policy.

The first paper, published in March 1999, *Acid Deposition in the UK*, analyses the current status of acidification in Britain today, the trends in both emissions and deposition and the future prospects for damage recovery. It was commissioned by NSCA and forms its contribution to the debate on future acidification policy.

The second paper, *Problems with Particles*, by Dr. R.L. Maynard of the Department of Health, was published in June 1999; it demonstrates that while research on air pollutants - in this case particles - often identifies major uncertainties , policy decisions cannot be delayed while those uncertainties are resolved.

The next paper in the series is to look at IPPC and beyond - developments in European policy and urban air quality management.

Copies of the first two papers are available to NSCA members free-of-charge. Contact Sally May on 01273 326313, or Email:admin@nsca.org.uk

NSCA News

A NOISE STRATEGY FOR THE UK

Ritt Bjerregaard, European Commissioner for the Environment, in a recent speech in Copenhagen, said that "noise is, with air quality, the most integrated environmental problem at the urban level...we could almost say that noise is the indicator of the condition of the city and our urban environment."

NSCA's National Noise Committee has been discussing the need for a National Noise Strategy and its role in helping to shape UK noise policy. It has now set up a working group to draw up detailed proposals based on the principles and priorities outlined below.

Need for a Strategy

It is widely accepted, among noise control specialists, that the number of people exposed to higher noise levels in the UK, and in fact across the whole of Europe, is increasing. This is particularly true in urban areas, where the continuing rise in road traffic and an intensification in land use has led to an increase in environmental noise levels. While many technical innovations, to control noise emissions at source, have made a contribution, others have failed to deliver the required noise reductions. The need for a coherent and integrated noise policy can be illustrated as follows:

- There needs to be a better balance between measures to control noise at source and planning and management measures addressing general exposure to environmental noise.
- Policy development within Government and other regulatory bodies has been fragmented; there now needs to be a more coherent and integrated approach.
- Noise mapping (as detailed in proposed EU Framework Directive on Environmental Noise, the first stage of which will be published in 1999), if implemented in isolation, will raise public expectations concerning noise reduction measures. Noise mapping must become part of a strategic approach to environmental noise control.

The Opportunity

Over the next few years, the ability to measure and map the noise climate at local level will be substantially enhanced. Current proposals for the EU Framework Directive on Environmental Noise would require noise mapping, at least in major European areas, against defined criteria and thresholds. Even in the absence of legal requirements, it seems likely that the capability will be increasingly deployed in the UK, since it offers major opportunities for the better understanding of noise problems. This is to be welcomed both for the powerful policy development tool it offers and for opportunity to redirect resources to areas of real need.

The progressive introduction of noise mapping presents both an opportunity and a threat. As an opportunity, it can provide the foundation for a more coherent and prioritised approach to noise policy, which ensures that the right balances are struck and the most needy problems are addressed. However, it could also be a threat, from the perspective of local authorities and other regulatory bodies, since if it is not applied within the framework of coherent policy and priorities, the pressures that it will generate on local authorities from local interest groups will be exceptionally difficult to handle.

These developments take place against the background of a continuing need to reduce environmental noise in the UK. While it is unclear to what extent overall noise levels within the UK are increasing, it is apparent that in many areas they reach levels which involve significant stress and disamenity. A recent European Green Paper reported that almost 80 million people in the European Union are continuously exposed to unacceptable levels of daytime transport noise and a further 170 million are exposed to levels sufficient to give rise to serious annoyance.

Principles and Priorities for a Strategy

The NSCA believes that, in combination, these considerations make it urgent that the Government commit itself to the development of a more coherent and integrated approach to noise policy in the UK, and an effective strategy for the reduction of unacceptable environmental noise.

The Society believes that such a strategy should encompass the following key features:

- The main focus must be shifted from the technical opportunities for noise reduction at source, as at present, to the aggregate effects on people in their homes.
- In developing a strategy, the Government should also look at all noise sources, and all possible remedial approaches, on a common and objective basis. This implies the need to refine and further develop common cost/benefit approaches which can clearly identify the most effective options.
- It should be based upon commonly accepted exposure standards and thresholds, but should recognise that, since noise affects amenity rather than physical health, minimum standards should not apply everywhere. The strategy should seek to address areas

of excessive noise without compromising areas where levels are below the minimum standard;

- A major element of the strategy should be more effective mechanisms for ensuring that noise considerations are taken properly into account in all strategic planning and transportation policy decisions;
- Opportunities for the technological or planning changes which can substantially improve a local noise climate may arise only infrequently, or have long lead in times. The strategy must therefore have a clear sense of timescale and priorities.
- The strategy should address the question of how significant further deterioration in the noise climate can be addressed. Such measures can provide the breathing space required while techniques are further developed to tackle in a more proactive way existing environmental noise problems;
- While a strategy is needed primarily to address general environmental noise, it must also take into account neighbour noise. The proposed review of the 1996 Noise Act can be used as an opportunity to establish a more coherent national approach which ensures that certain minimum service standards are provided generally. However, this should still allow the setting of local priorities at the local level;

The development and implementation of a noise strategy will require a stronger focus for noise policy within central Government. The bringing together of the Departments of Environment and Transport, two of the Departments with major noise interests, is helpful in this respect. It is essential, however, that the process of consolidation be taken further, and the previous fragmentation of approaches to noise policy within Government is brought to an end. This will mean that a properly targeted and cost-effective general policy can be developed.

Noise enforcement and control has almost solely been the responsibility of local authorities and, as a result, they contain a vast wealth of expertise and experience. The value of this resource should be fully recognised by the strategy and enforcement responsibilities allocated accordingly. Allowing local authorities to remain as the principle agents for achieving the strategy's aims, through strategic planning and enforcement, is entirely consistent with a modern approach to policy implementation. Placing these duties with either a regional or national body, at the expense of local action and involvement, must be seen as a retrograde step.

Timescale

Clearly, any strategy must have a strong base, achieve general consensus and be appropriately linked with developments in Europe. It is appreciated that the development of a strategy in an inclusive and open manner, as required by modern government, will take time. However, the NSCA considers that the central features could be formulated relatively quickly, and that a first stage strategy should set up the process for further development. This might aim, in particular to avoid significant further deterioration in the extent of tranquil areas, and to ensure that planning proposals take further account of noise considerations. With those priorities in place, it would be reasonable to pursue other changes over a relatively longer timescale.

NSCA believes that the first step should be for the Government to publish a discussion paper on the development of noise strategy, indicating its general targets and preferred approach.

NATIONAL NOISE ACTION DAY 1999

As you should have heard by now, NAD 1999 is on Wednesday 1 July. NSCA is working with the Department of the Environment, Transport and the Regions, and with other national organisations with an interest in noise - aviation groups, the British Tinnitus Association, Chartered Institute for Environmental Health, Mediation UK, Health and Safety Executive, Noise Network and the Royal National Institute for Deaf People - in planning a campaign that will educate both noise makers and noise sufferers about the impacts of environmental noise pollution. A NAD information pack with a colour poster and decibel chart has been distributed to all Chief Environmental Health Officers and potential participants.

Westminster City Council are encouraging all schools to take part, and a government minister has been invited to participate. The Noise Network will set up a helpline on the day to deal with enquiries, and the RNID will be highlighting the effects of noise exposure on hearing. Mediation UK are promoting mediation as an alternative form of conflict resolution and the Aviation Environment Federation and Airports Policy Consortium calling for proposed powers for local authorities enabling enforcement of noise mitigation agreements to be implemented.

NSCA are carrying out the annual survey of local authorities in England and Wales, and in Scotland, looking at sources of complaint, legislation and enforcement and future noise policy. The results will be published for National Noise Action Day.

For an information pack contact Sally May, Email admin@nsca.org.uk. For further information or to let us know about your activities contact Mary Stevens, Email info@nsca.org.uk

Reports

EUROPE'S ENVIRONMENT - THE SECOND ASSESSMENT

Domingo Jimeñez-Beltrán
Executive Director
The European Environment Agency

Sr. Beltrán was a speaker at NSCA's centenary conference in December in which he took as his theme "Environmental Trends in Europe and Beyond: Problems and Prospects for the Next Century. The European Environment Agency has been monitoring the state of Europe's environment since 1991, with the results being published in a report which has come to be known as The Dobris Assessment - named after Dobris Castle, near Prague, where the "Environment for Europe" process started in 1991.

The following article is a summary of a presentation to the Fourth Ministerial Conference: Environment for Europe, which took place in Aarhus, Denmark from 23-25 June 1998, in which Sr. Beltrán presents the EEA's second assessment of the state of Europe's environment.

Introduction

The European Agency has three main tasks:

- to collect and generally improve the consistency of the required monitoring data on the environment;
- to bring together the expertise to interpret and assess the data and provide policymakers, and also socio-economic agents and the public at large, with the best available information on the current and future state of the environment. This information is intended to support strategic policymaking in two equally important areas
  - i in the development of environmental policies themselves; and
  - ii in the development of sectoral policies that take proper account of environmental imperatives, in particular industry, agriculture, energy production, transport and tourism.

The EEA's work now extends beyond the countries of the European Union, to include 18 countries in Western Europe, as well as actively cooperating with 13 countries in Central and Eastern Europe.

Overview of Progress in Key Areas

Table 1 summarises the results of the most recent assessment of Europe's environment; it provides an overall judgement of progress - or lack of it - in the state of the environment and related policy. The table shows that while there has been progress in policymaking, there has been no substantial improvement yet in the environment.

Table 1. Overview of Policy and State of the Environment in Key Area's

	Progress	
Environmental Problem	**Policies**	**State of the Environment**
Climate change	→	↘
Stratospheric ozone depletion	↗	↘
Acidification	↗	→
Tropospheric ozone	→	↘
Chemicals	→	→
Waste	↘	↘
Biodiversity	→	↘
Inland waters	→	→
Marine & coastal environment	→	↘
Soil degradation	↘	↘
Urban environment	→	→
Technological hazards	↗	↗

↗ Positive development/change
→ Insufficient development; little change, uncertain
↘ No development; unfavourable change or still poor situation

This is a common feature in many areas studied; Table 2 shows the success in reducing emissions of substances that are the subject of International Conventions; sadly though there do not appear to have been any significant improvements in the *state* of the environment itself: rivers, lakes and seas still have high nutrient concentrations; chemicals are widespread; soils continue to deteriorate; waste continues to increase; there are still regular episodes of summer smog and nature and biodiversity is still endangered.

Table 2. Decreases in Emissions

sulphur dioxide:	50% reduction since 1980
lead:	60% reduction since 1980
phosphorus in many water catchment areas:	30-60% reduction since the 1980s
volatile organic compounds:	14% reduction since 1990
nitrogen oxides:	14% reduction in each since 1990

There are a number of reasons for this apparent failure. One is that processes and interactions within the environment are often slow, resulting in large time delays between a reduction in the emission of a pollutant and recovery of the environment. Perhpas the best example of this relates to the depletion of the ozone layer.

The Vienna Convention and the Montreal and other Protocols have been dramatically successful in reducing the production of ozone depleting substances, which is now only 10% of its peak value in the 1970s. But it takes many years for CFCs and other substances to reach the stratospheric ozone layer, and therefore it will take many years for the effects of the reductions to become apparent. In March 1997 the ozone layer over the North Pole was 40% thinner than normal, depsite the fall in CFC emissions. Recovery of the ozone layer is not expected before the middle of the next century, and even this will depend on the proper implementation of current policies, such as CFC recovery from old refrigerators, prevention of smuggling, and reduction in the use of HCFCs.

Thus there is need for a better mechanism for anticipating problems - a better early warning system.

Matching the Scale of Effort with the Scale of the Problem

Time delays are not the only problem. It is also a question of mismatches; there is often a lack of proportion between the scale and scope of effort and the size of the problems targeted.

Water Quality

Much has been done to decrease the emission of phosphorus to surface waters. Industry has reduced emissions by sometimes 60 - 90%, and lowering the phosphorus content of detergents has brought down emissions by households significantly. In many river catchments, discharges have been reduced by 30 - 60%, most of which was achieved at the end of the 1980s.

However, although there has been a general improvement in phosphorus concentrations, water quality is still poor in many rivers and lakes. This may sometimes be a question of time, but often reducing phosphorus emissions is not enough to prevent eutrophication occurring: the scale of the problem requires more to be done.

Nitrogen emissions are also of major concern, and nitrate concentrations in rivers are not yet falling. This is especially worrying for some coastal environments, where nitrogen concentrations are still at the same level as in 1990, and regular eutrophication episodes still occur. Groundwater quality is also being affected; concentrations of nitrate above the maximum admissible levels for drinking water, whose main source is groundwater, have been found in almost all countries.

This mismatch between the scale of measures and the scale of the environmental problems seems to occur not only for inland waters, but also for greenhouse gas emissions, summer smog, pesticides in groundwater, waste polluted sites, soil degradation and even acidification. It also seems to occur especially where societal sectors have displayed a quick growth in their activities, and where environmental policies do not have that much influence. Transport and agriculture are clear examples.

Transport

In Europe, transport is now the largest source of NO_x emissions - some 60% - and it is the source of about 45% of the emissions of volatile organic compounds in Western Europe.

Transport is of particular importance because of its rapid rate of growth; goods transported by road in Europe have increased by 54% since 1980, and passenger transport by road by 46% in the last ten years in the EU. Passenger transport by air has increased even more rapidly - by 67% in the past ten years in the whole of Europe. The benefits resulting from the introduction of cleaner fuels and cleaner cars cannot keep pace with such growth.

Integration: Multi-effects and Benefits

Integration of environmental imperatives into sectoral policies should not only help to meet the challenge of matching development in the sector with the requirements posed by the environment; it also presents opportunities for solving many environmental problems in one go. The EEA's Second Assessment makes it clear, once again, that some sectors are causing a multitude of the major problems. Actions influencing the volume or modal split of transport could lead to improvements in climate change, acidification, summer smog, urban problems, traffic safety and atmospheric lead pollution.

The real challenge of achieving environmental improvement makes a switch to more sector-oriented environmental policies necessary - and even urgent - particularly in the light of the greenhouse gas reduction target agreed in Kyoto, the expected targets of the UNECE multi-pollutant, multi-effect protocol, and the need to reduce environmental levels of heavy metals and persistent organic pollutants.

It also has to be accepted that future improvements in environmental quality will not come directly from environmental policies, but from socio-economic policies supported by environmental policies. This includes - apart from policies on energy, transport, agriculture, tourism, etc - instrumental "horizontal" policies, in particular in financing and fiscal matters.

The Challenges and Opportunities of Enlargement

Much of this paper relates to pan-European problems, but it is also good to look at the variety in our continent.

While the overall emission reductions that have been achieved are to be welcomed, it should not be forgotten that a part of these has been due to economic restructuring in Central and Eastern Europe. This has resulted in a tremendous drop in industrial production and, for example, a 23% decrease in energy use since 1990. This implies that, even more than before, it is the countries of western Europe that are causing the largest part of the emissions in Europe.

It also means that if economic recovery in the countries in the eastern part of Europe continues - something we all look forward to - those countries may need to use all their creativity and innovation (and why not that from the rest of Europe too) to prevent huge increases in emissions and further degradation of the environment. And for this, the cooperation of all those around the table - including the financing institutions - is needed. The EEA's assessment points to the huge potential for improvements in energy efficiency in Central and Eastern Europe and especially New Independent States, and the same probably applies for other resources. Technology, but, even more than that, wise management and innovation in general can bring huge gains here. This should be part of rethinking the approach to the environment in Eastern Europe, going from *simple compliance* with Western European legislation *as a goal*, to taking the road to sustainable development and *having compliance as a result*. The latter might be more cost-effective and, in addition, spare nature where *it is still* in better shape than in other parts of Europe. And this is particularly the case for the EU Accession countries where the overall costs of compliance have been evaluated at over 100 Billion ECU. By establishing sustainable development as a goal, and compliance as a result, some short-cuts will certainly be identified of benefit for the whole of Europe. As the European Commissioner for the Environment, Ritt Bjerregaard, put it "Enlargement is the biggest challenge ever for EU environmental policy and one of the ultimate tests for it".

Conclusions

As the EEA's Assessment of the Environment in Europe demonstrates, there is still much that needs to be done by all sectors if real improvements are to be seen. As well as continuing to monitor the environment, the EEA has a particular role to play in the following areas:

1. Follow-up to the 4th Ministerial Conference, Aarhus, June 1998

The EEA should be in a position to support the work of the Ministerial Conference in the building up of what has been defined as "an open European space for environmental information" by:

- maintaining, improving and updating the appraisal of the current and future state of the environment in Europe;
- working with the countries of Europe in building and operating an active network for data collection and for improving consistency at the European level; this should build upon *existing networks like that of UNEP* and the EEA and on national capacities;
- closing the gap between information and policy-making by using indicators for the evaluation of progress on a regular basis, and developing timely and regular outlook-type reports for strategic policy-making;
- completing - urgently if thought appropriate, and if funds allow - the overview on topics where there is no clear picture of the European situation yet, *such as technological risks*, in particular chemicals and radioactivity, and an assessment of natural areas and biodiversity, with special focus on Central and Eastern Europe.

2. Policy Assessment

The policy assessment shows a simple grouping of policies which highlights how far we have come in tackling environmental problems, for example:

- *successful but late* - stratospheric ozone depletion;
- *successful but insufficient* - acidification, eutrophication, tropospheric ozone;
- *basically unsuccessful* (i.e. not going to the heart of the matter) - waste and soil protection;
- *Partly unsuccessful and mostly insufficient* - climate change (greenhouse gas emissions), urban environment (air quality and noise), inland waters, marine and coastal environments, nature (biodiversity);
- *Not able to be evaluated* - chemicals, technological risks, including radioactivity and GMOs.

3. Policies Requiring Special Consideration

Some policies may require special consideration or focus at European level because of their multiple and "pulling" effects on sustainability, without forgetting that the change of the sectoral policies or driving forces is the heart of the matter. Priorities in this category include:

- *Climate change or reduction of the emission of greenhouse gases*, because of its crucial long-term significance and the multiple benefits that will arise from action to control the relevant pollutants;
- *Waste reduction*, because there is still so much to be done to implement proper waste reduction and management throughout Europe, and because of its continued linkage to economic development;
- *Chemicals*, because of their widespread use and impacts, but also because information on exposures and toxicities is so scarce;
- *Nature and soil protection*, for safeguarding valuable natural resources and biodiversity and its functions, which, once damaged, are difficult, if not impossible to recover;
- *Air quality* could be added because it still compromises, in a direct and unavoidable way, the life and well-being of so many Europeans. Hopefully, however, this will not even be on the Agenda for the next Ministerial Conference, and if so, only as something of the past.

AN ASSESSMENT OF AIR QUALITY MONITORING IN SCOTLAND

Environmental Assessment Group Limited

In 1997, the Scottish Office Agriculture, Environment and Fisheries Department commissioned Environmental Assessment Group Limited to evaluate and assess the spatial coverage of existing air quality monitoring networks within Scotland, and to identify the need for further air quality monitoring sites in order to fulfil the UK's obligations under EC Directives and Regulations (existing and proposed).

Main Findings

- There is a wide disparity in air quality monitoring between local authorities. A need for a global and strategic approach to the planning and implementation of air quality monitoring throughout Scotland has been identified.
- No significant deficiencies have been identified within the lead and carbon monoxide monitoring networks.
- An additional benzene and 1,3-butadiene monitoring site within the Glasgow conurbation will be necessary under the requirements of the proposed EC Directive.
- Additional monitoring of nitrogen dioxide is likely to be necessary in both industrial and rural areas of Scotland.
- A need for additional monitoring of ozone has been identified, in particular in remote and rural areas.
- Limited PM_{10} monitoring is currently taking place, further monitoring in urban and industrial areas and in areas close to trafficked roads is likely to be necessary.
- Further sulphur dioxide monitoring will be required in both industrial and rural locations under the proposed EC Daughter Directive.
- Existing air quality in Scotland is generally in compliance with relevant air quality limit and guide values. However, potential exceedances of nitrogen dioxide may occur close to heavily trafficked roads, in particular within urban areas; ambient concentrations of PM_{10} are close to or exceed the proposed EC standards and UK Air Quality Objectives within the main urban centres; and exceedances of the EC Ozone Directive protection level for vegetation is currently widespread, particularly within rural areas.

Introduction

The objectives of the project were threefold. Firstly to assess the adequacy of the UK National Air Monitoring requirements with respect to the relevant EC Directives and Regulations (existing and the proposed) and to identify what additional monitoring may be required in Scotland in order to fulfil the UK's obligations.

Secondly, to evaluate the spatial coverage of the existing monitoring networks in Scotland, in particular, their value in generating information for use by local authorities for air quality assessment purposes, by defining current local authority air monitoring and identifying likely or potential air pollution "hot spots".

Thirdly, the results of the project will assist the Scottish Office in the implementation of the UK National Air Quality Strategy, in particular when awarding specific consents to local authorities to incur capital expenditure on monitoring equipment.

Methodology

The project focused on the eight key air pollutants: benzene, 1,3-butadiene, carbon monoxide, lead, nitrogen dioxide, ozone, fine particles (PM_{10}), and sulphur dioxide. The initial stages of the project involved the collection and collation of a substantial quantity of raw data, comprising information on industrial processes in Scotland with significant emissions to air, roads with high volume traffic flows (›250,000 vehicles per day), UK network air quality monitoring sites, and local authority air quality monitoring sites.

Existing air quality in Scotland was reviewed using the results of the UK Air Monitoring Network. The results were compared with the UK Air Quality Objectives (AQOs) and the EC air quality standards to determine where existing air quality was close to or exceeded the established legislative limit, guide or threshold values. The industrial and road emission sources and the review of existing air quality were used to identify potential pollution hot spots for each of the major pollution species.

The final part of the study assessed the current monitoring practices in Scotland, both as part of the national monitoring networks and that carried out by individual local authorities. Potential deficiencies in the current level of monitoring with respect to the requirements of the relevant EC Directives and UK legislative requirements were identified.

Findings

Air Quality in Scotland

Comparison of the monitoring results from the UK Air Monitoring network for **benzene, 1,3-butadiene, carbon dioxide** and **lead** with the relevant UK and EC air quality limit and guide levels suggests that ambient concentrations are within the recommended limits throughout Scotland.

Current **nitrogen dioxide** monitoring results demonstrate that exceedance of the current EC guide, proposed EC standard and UK AQOs may occur at kerbside locations adjacent to heavily trafficked roads. Exceedance of the UK annual mean AQO may be more widespread, occurring in many urban areas.

Highest levels of **ozone** occur in rural areas. Current ozone concentrations are expected to be within the UK AQO, but exceedances of the current EC Directive protection level for vegetation is widespread (particularly in rural areas). In addition, some exceedance of the EC Directive threshold information value and the EC Directive health protection level may arise.

The monitoring results demonstrate that ambient concentrations of **PM_{10}** are close to or exceed the proposed EC standards and the UK AQO. The highest level of exceedances are to be expected in urban areas close to heavily trafficked roads.

Sulphur dioxide concentrations are within the current and proposed EC limits, but exceedance of the UK AQO may be experienced where high levels of emissions coincide with periods of poor dispersion.

Efficacy of Current Monitoring

For each of the pollutants included in this review, the study highlighted the wide disparity in monitoring between local authorities. This disparity could only be partly explained by the differences in the number of emission sources. A need has been identified for a more “global”/strategic approach to air quality monitoring to ensure a more consistent coverage. This is particularly important when considering ozone and to a lesser extent their precursors.

Benzene and 1,3-butadiene

Potential hot spots may arise in areas local to major industrial sources, where plume grounding or high concentrations of fugitive emissions may occur, in particular in combination with adjacent busy roads. No real cluster of industrial emission sources exists, although several are present in Grangemouth.

It is considered that sufficient air quality monitoring locations have been established to monitor benzene and 1,3-butadiene concentrations from traffic sources. However, a proposed EC Directive will require an additional monitoring location within the Glasgow conurbation, and an additional site may be required around the Grangemouth area.

Carbon Monoxide

The major concentrations of carbon monoxide emission sources occur in the urban areas of Glasgow, Edinburgh, Aberdeen and Dundee. In these locations heavily trafficked roads are located in proximity, close to the city centres and in some places may coincide with significant industrial sources. The existing coverage of CO monitoring sites is relatively comprehensive, though an additional monitoring location could be considered within Dundee.

Lead

No deficiencies in the current lead monitoring network have been identified.

Nitrogen Dioxide

The major concentrations of emission sources are the urban areas of Glasgow, Edinburgh, Aberdeen and Dundee, where emissions from heavily trafficked roads are likely to combine with those from industrial processes. In addition, it would be anticipated that nitrogen dioxide concentrations at Grangemouth would be elevated, due to the significant number of industrial processes and the major traffic flows associated with the M9.

Under the National Network there is no monitoring of nitrogen dioxide concentrations in any industrial or rural location in Scotland. The proposed EC Directive will require monitoring at these locations.

The UK National Nitrogen Dioxide Diffusion Tube Survey results are not suitable for demonstrating compliance with the majority of the EC and UK air quality standards. However, they will be of use to local authorities in carrying out local air quality reviews.

Ozone

Typically, the highest concentrations of ozone are found in rural areas, at some considerable distance from the potential pollutant sources. Areas of high concentration are very dependent on the prevailing weather conditions. The three existing rural monitoring locations within Scotland are not likely to be sufficient to provide a full understanding of the causes and patterns of ozone formation or the extent of the areas that may experience exceedances. In order to aid understanding of the transboundary nature of ozone, additional monitoring sites could be established on the south-west and central east coast of Scotland.

PM_{10}

The main concentration of emission sources occurs in similar locations as those for nitrogen dioxide. Given the significance of industrial sources to PM_{10} emissions, the highest concentrations would be expected to occur in industrial areas such as Grangemouth, where roads carrying heavy traffic flows occur in conjunction with industrial sources. Elevated PM_{10} concentrations would also be predicted for the major urban areas, where the traffic sources predominate.

The existing monitoring network for PM_{10} concentrations is relatively limited and does not cover fully the potential areas of exceedances. Given that exceedances of the PM_{10} limits are predicted throughout the UK, additional PM_{10} monitoring locations are likely to be necessary to comply fully.

Sulphur Dioxide

The major concentrations of sulphur dioxide emission sources are expected to occur in Edinburgh, Grangemouth and Glasgow. There are also a significant number of isolated industrial sources in a narrow band along the east and north-east coast.

Currently there are only two national automatic monitoring sites monitoring sulphur dioxide within Scotland and no monitoring sites at any industrial or rural location within Scotland. The Daughter Directive on Air Quality (covering SO_2, NO_x, particulates and lead) - resulting from the EC Ambient Air Quality Assessment and Management Directive - will require monitoring at these locations. In areas identified as potential exceedances, it will be difficult to demonstrate total compliance with the AQO without employing large numbers of automatic monitoring stations. It is in these situations that the benefits of dispersion modelling may be of greatest significance.

Conclusions and Recommendations

One of the findings of the project has been that monitoring varies greatly from authority to authority, and a need for a more "global"/strategic approach has been identified to ensure a more consistent coverage of monitoring sites. This is particularly important when considering pollutants of regional/national concern such as ozone and to a lesser extent nitrogen dioxide and volatile organic compounds - both ozone precursors. When considering air quality management and, in particular, air quality monitoring, local authorities should be encouraged to consult neighbouring authorities and, where relevant, develop a collective approach.

The research demonstrated that additional air quality monitoring sites are likely to be required for the pollutants benzene, 1,3-butadiene, nitrogen dioxide, ozone, PM_{10}, and sulphur dioxide. Further monitoring sites will be necessary in order to enable the UK to comply with both EC Directives and to provide the means for local authorities to carry out air quality assessments of their administrative areas.

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The full research report, of which this is a summary, may be purchased from HMSO Bookshop, 71 Lothian Road, Edinburgh EH3 9AZ.

OZONE AND PM_{10} MONITORING IN CORNWALL, UK

Leo Salter, Barbara Parsons and Fleur Fisher

Cornwall College, Camborne

Ozone and PM_{10} were monitored in the far south west of the UK mainland. Observed concentrations were of similar magnitude to those in UK urban centres. Although source(s) of the pollutants are distant from Cornwall, significant damage to the ecology of the region is likely to result from them.

Introduction

This paper presents results from air quality monitoring at two sites in Cornwall. The study is directed at ozone - monitored at Tregonning Hill (TH) in the far west of the county - and PM_{10} - monitored at TH and St. Dennis (SD) in the china clay area in mid- Cornwall (see Figure 1). The data obtained were of similar magnitude to those at urban sites in the UK.

Cornwall is in the far south west of the UK and contains a high number of special national designations covering wildlife habitats. For instance 400 km of coast are defined by the Countryside Commission as Heritage Coasts; there are many Sensitive Marine Areas, Areas of Outstanding Natural Beauty (AONB) and Sites of Special Scientific Interest (SSSI). Although atmospheric deposition is recognised as having a significant impact on the coastal zone, little work has been done to assess the consequences for Cornwall of long-term exposure to air pollutants - not the least of these consequences being the implications for health, habitat preservation, biodiversity, agriculture and tourism.

The results presented in this work indicate that in order to preserve the high quality natural environment of Cornwall, the effects of atmospheric deposition need close attention.

Equipment and Methodology

Particulate matter was monitored in two ways. First, using a 1400a TEOM (Tapered Element Oscillating Microbalance) providing 15 minute PM_{10} masses from a 3 dm^3 min^{-1} airflow. This monitor was situated on the roof of St. Dennis Primary School in SD and air was sampled approximately 3 m above ground. Second, using two Partisol Model 2000 Air Samplers with slave units (a flow of 16.7 dm^3 min^{-1} through a 47 mm filter medium). One Partisol was co-located with the TEOM at SD, the other Partisol was co-located at TH with the ozone monitor. Both the TEOM and the Partisol are supplied by ETI Group Ltd (Cheltenham), manufactured by Rupprecht and Patashnick, and are US EPA equivalent methods. A NM950 Environmental Monitoring Weather Station (ex-ELE International Ltd) was also installed at SD. Details of the comparison between the TEOM and the Partisol and of the filter-weighing procedures have been published elsewhere[1].

Ozone was monitored using an Environment S.A. O341M-LCD UV Photometry Ozone Analyser supplied by Siemens, Dorset. The instrument was first commissioned in August 1997 and performed a daily self-calibration check. There was also a six monthly calibration recheck by the manufacturers.

The two monitoring sites were different in kind. The SD site (SW 953 581; population 2405) is classed as U4 (NAQS Guidance, Annex 4)[2] and lies within a "horseshoe" of clay tips with a roadstone coating plant and china clay dryers nearby. It is inland (Figure 1), at an elevation of 175 metres and was chosen at the behest of DETR who wished to examine the contribution to atmospheric PM_{10} of the china clay mineral extraction processes in the region. TH (Figure 1) is classed as R1 (NAQS Guidance, Annex 4)[2] and is a rural site situated 182 m above sea level (SW 604 293), close to the coast (2.5 km), some 150 km west of the nearest national ozone monitoring station (Yarner Wood - Figure 1). TH is prominent and is exposed to wind from all directions.

Results

PM_{10}

Figure 2 shows a comparison (March 1998) between PM_{10} concentrations monitored at SD (TEOM) and those from Bristol, Plymouth and Nottingham. Two features of Figure 2 are worthy of attention. First, as reported by other workers[3], there is some agreement in the temporal variation between the levels monitored at all sites irrespective of their type (rural or urban) and location. Second, the Figure shows a 'particulate matter event' occurring over the period 14 - 18 March. Levels recorded at SD were of the same order as those at the other UK sites. As has been reported elsewhere such events are typically associated with easterly and south-easterly winds[3], but the March event in Cornwall (Figure 2) was during a period of westerly winds of low speeds (Figure 3).

Figure 4 compares the average diurnal variations in PM_{10} for March 1997 and March 1998 at SD with those from Bristol. It can be seen that levels at SD peak in the evening between 16.00 and 21.00, whilst those at Bristol peak in the morning between 07.00 and 11.00. We identify the latter with morning traffic and the former with domestic coal fire emissions in SD. Figure 5 supports the second identification by comparing the average diurnal variation in PM_{10} concentrations (1997-1998) at SD in summer and winter; for the months May to September (summer) there is no evening peak, but for October to April (winter) there is.

Comparison of the PM_{10} concentrations measured using Partisols at TH and SD showed some consistent differences that could be associated with 'local' sources - for instance, for the period March to July 1998 SD was on average 2.5 μg m^{-3} higher than TH. It is tempting to associate this difference with china clay extraction processes in the locality of SD but there is as yet no analytical evidence to support this - indeed domestic fuel burning at SD may well be responsible (see Figures 4 and 5). However, these small 'local' effects aside, the PM_{10} levels monitored at SD and TH are those which are generally extant across West Cornwall.

The annual (1/04/97 - 31/03/98) average PM_{10} concentration at SD (TEOM) was 21 μg m^{-3} and is similar to annual averages measured at Bristol 24 μg m^{-3}, Nottingham (23 μg m^{-3}) and London Brent (21 μg m^{-3}).

Ozone

Figure 6 shows the average diurnal variation in ozone concentrations at TH for June - September 1998. Concentrations reach a maximum during the late afternoon but do not show the dramatic night-time decrease observed at inland urban centres[4]. TH is near the coast at an elevation of 182 m, consequently little deposition of ozone occurs and the amplitude of the diurnal variation in ozone concentrations is small[4].

Figure 7 shows a comparison (9/10 August 1998) of ozone concentrations at TH, Yarner Wood and Bristol Town Centre. Levels at TH are generally higher than the other two sites but (Figure 6) do not show as much diurnal variation.

Figure 8 compares ozone concentrations (12-30 June 1998) at TH with those from Bristol (B), Plymouth (P) and Nottingham (N). The TH ozone levels are higher than those from the other three sites (concentration maxima decrease TH→P→B→N as deposition occurs) and there is a time-lag in the concentration peak as the ozone rich continental air mass moves across the UK.

The average ozone concentration at TH (12 June 1998 to 22 October 1998) was 32 ppb; this is higher than those at Yarner Wood (28 ppb), Bristol (20 ppb) and London Brent (20 ppb).

Discussion

The data indicate that in spite of its remote and rural situation Cornwall is exposed to damagingly high concentrations of particulate matter and ozone. Because the monitored concentrations vary in a similar way to those observed nationally the conclusion is drawn that the pollutants are from distant sources - this is consistent with work reported elsewhere[3,4], though unlike elsewhere in the UK PM_{10} episodes in Cornwall are not uniquely associated with Easterly air flows[3].

The effects of these concentrations of pollutants on an area which is noted for its unique diversity of habitat will be significant - as will the long term impacts on agriculture, tourism and (possibly) health. There is a requirement for both systematic air monitoring in the region and identification of the source(s) of the pollutants as prerequisites for any strategic response.

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2. DOE (1996), Guidance on reviewing and assessing air quality for first phase areas, *working draft.*
3. King A. & Bennett S. Comparisons of Non-urban Levels of Particulate Matter, Urban Network and Meteorological Data, *ETSU Report Number ETSU N/01/00033/REP, DTI, 1997.*
4. PORG (1997), Ozone in the United Kingdom, Report of the DETR Photochemical Oxidants Review Group. Department of the Environment, Transport and the Regions.

Acknowledgements

The authors thank the Cornwall Air Quality Forum (Cornwall College, Cornwall County Council and five (Penwith, Kerrier, Carrick, Restormel and North Cornwall) of the six local authorities in Cornwall) for funding this work.

Leo Salter and Fleur Fisher are currently at Exeter College, University of Oxford.

Figure 1. Map of the far SW UK showing Yarner Wood (YW) and Plymouth (P) - both national network sites - and St. Dennis (SD) and Tregonning Hill (TH).

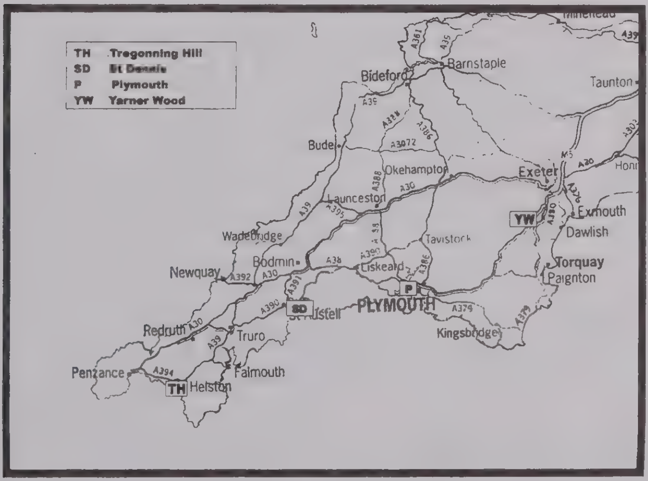


Figure 2. A comparison between PM_{10} concentrations monitored at St. Dennis (SD), Bristol (B), Plymouth (P) and Nottingham (N) for March 1998.

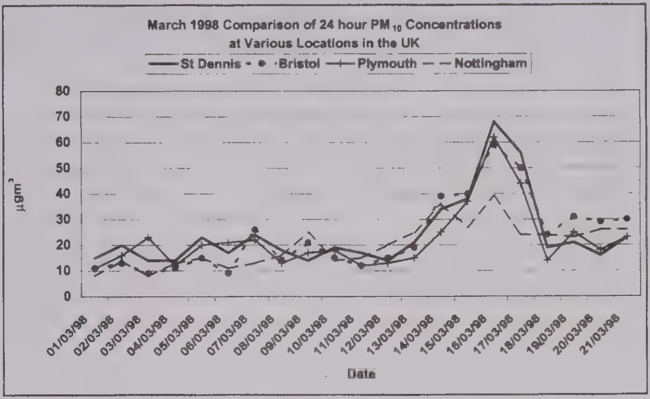


Figure 3. Wind speeds and wind direction for March 1998 at St. Dennis.

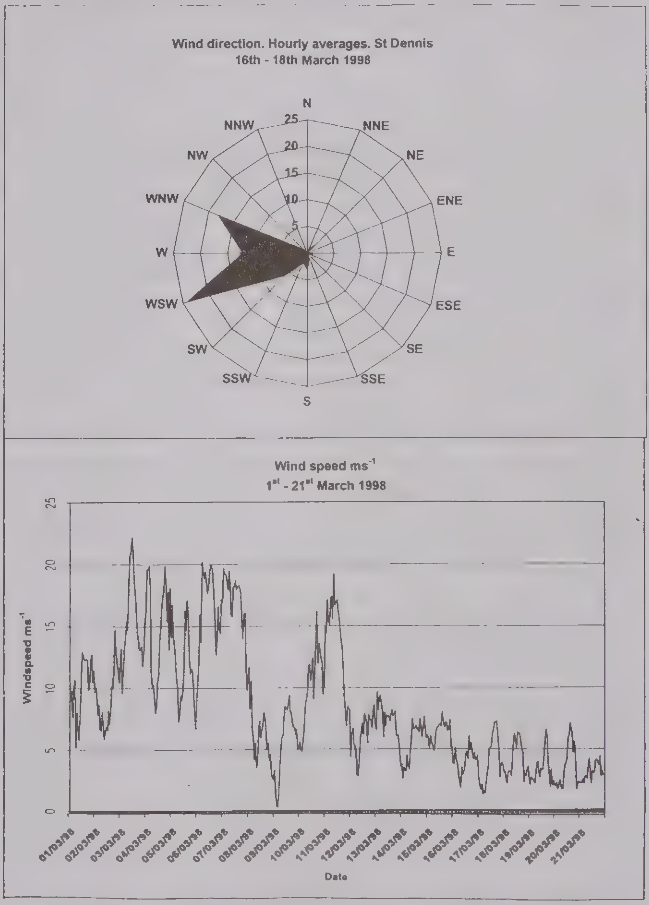


Figure 4. Average diurnal variations in PM_{10} for March (1997 and 1998) and St. Dennis (SD) and Bristol (B).

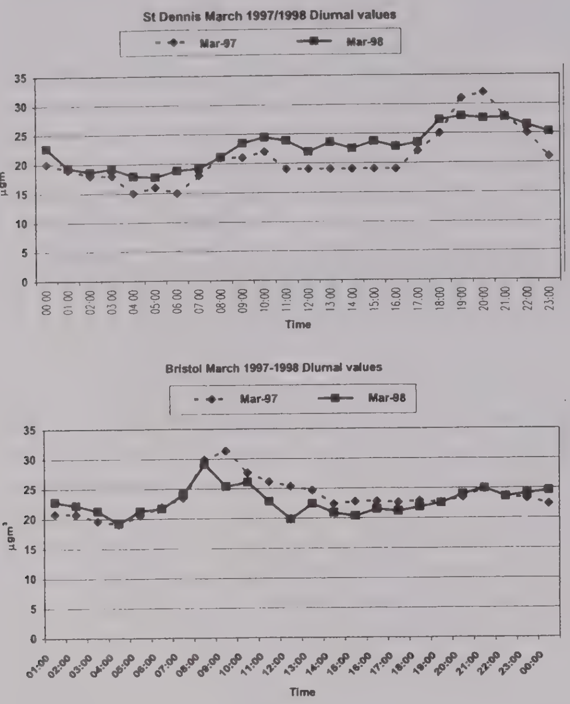


Figure 5. Average diurnal variations in PM_{10} for summer (May to September) and winter (October to April) 1997-1998 at St. Dennis.

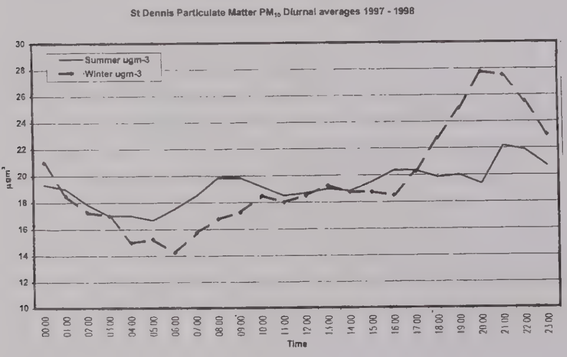


Figure 6. Average diurnal variation in ozone concentrations at Tregonning Hill (TH) for June - September 1998.

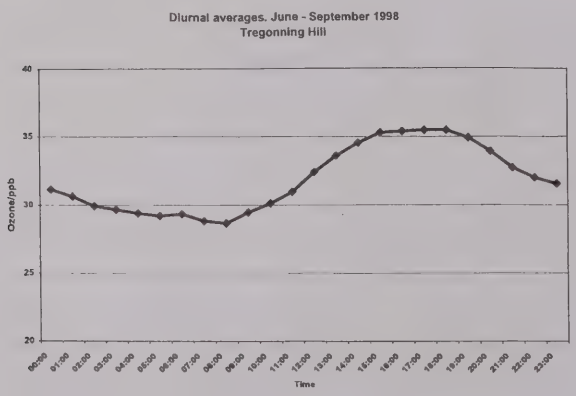


Figure 7. A comparison (9/10 August 1998) of ozone concentrations at Tregonning Hill (TH), Yarner Wood (YW) and Bristol Town Centre (B).

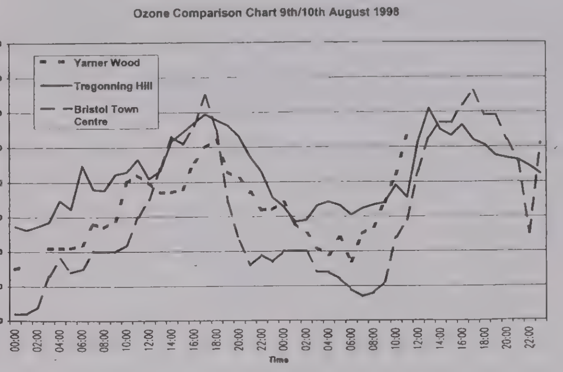
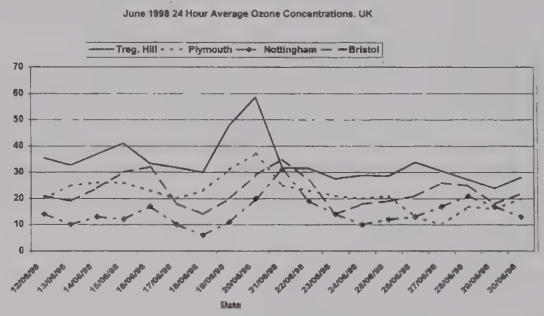


Figure 8. Ozone concentrations (12-30 June 1998) at Tregonning Hill (TH), Bristol (B), Plymouth (P) and Nottingham (N).



Update

Environmental Management

The international environmental management system standard ISO 14001 was published in September 1996 and is to be reviewed during 1999. While the importance of the standard is recognised, the way in which it is used by business organisations has raised many as yet unanswered questions, including:

- Does it deliver tangible improvements in environmental performance?
- Is there variability in certifications?
- Are there any regulatory - or market - benefits for ISO 14001 certified organisations?
- Of what relevance is ISO 14001 to small and medium sized enterprises?
- How does ISO 14001 work with other environmental standards?
- is there a transatlantic difference in implementation of ISO 14001 in North America and Europe, and is it being used as a technical barrier to trade penalising developing countries?

Greenleaf Publications is to publish a special issue of the journal *Greener Management International* on the topic of ISO 14001 Case Studies and Practical Experience in February 2000; these will subsequently be published in a book in April 2000.

The intention both for the special issue of GMI and for the book is to present perspectives from business, stakeholders, business support organisations, government, regulators, consultants, certifiers/verifiers, auditors and academia from across the world to try to answer some of the questions and evaluate overall progress and problems to date.

For more information, contact the Guest Editor, Dr. Ruth Hillary, tel/fax: 0181 968 6950; Email: r.hillary@ic.ac.uk

EMS Survey

A nationwide survey is to be carried out to assess the difficulties companies are finding when implementing environmental management systems (EMS) to the requirements of ISO 14001.

The aim of the survey, which is being administered by BTTG Environmental Science, is to identify the problems encountered during the implementation process, to review the guidance provided within the standard, and to assess the areas where further guidance is needed.

It is believed that the experiences and opinions of companies which have already successfully achieved certification will help to ease the task for those applying in the future. It is hoped that the information obtained from the survey will provide a useful input into the forthcoming revision of the standard and its associated guidance document ISO 14004.

The survey will be in two stages: first a short questionnaire to about 450 certified companies and then more detailed discussion with a representative sample of these companies.

More information from Madlen King, tel: 0161 445 8141; Email: MSKing@bttg.co.uk

Greening Government

Four Central Government bodies (Including the DETR's HQ buildings) now have EMS certification under ISO 14001. Environment Minister, Michael Meacher, has now awarded a contract to ENTEC and WS Atkins to help government bodies set up environmental management systems. This follows the Environmental Audit Committee's recommendation that all Departments should have begun introducing EMSs by the end of Parliament; the Government is also sympathetic to the recommendation that 75% of Departments should have at least one site registered to ISO 14001 by 2001.

Noise Act Review

The Noise Act 1996, which introduced a new offence of night-time noise nuisance from domestic premises and clarified procedures for seizure of noise making equipment, is expected to be reviewed, as promised during the passage of the Act through Parliament, later this year.

The main aspect of the Act likely to be reviewed is the extent of local authorities' take-up of the adoptive sections of the Act (enabling them to use the night-time noise sections in their district) and subsequent use of those provisions; the review team will also seek views from those local authorities who, although they use the night-time noise provisions of the Act as good practice for dealing with such nuisance, have not formally adopted them. Finally the review is expected to look at how night-time noise nuisance is dealt with by those local authorities who do not use the Noise Act, and the effectiveness of their arrangements.

The aim of the review will be to assess the extent of night-time noise nuisance from domestic premises and the effectiveness of the current legislation in dealing with the problem; the review team will also be finding out whether local authorities consider further measures are necessary to make the legislation more effective.

COMAH 1999

The new Control of Major Accident Hazards Regulations came into force on 1 April, replacing the 1984 Regulations; they implement the EU's 1996 EU Directive on the control of major accident hazards (the "Seveso II" Directive).

COMAH regulates establishments which produce or use substances with flammable, toxic or explosive properties and which thus could have serious consequences for both people and the environment if there were to be an accident. The Regulations provide a framework for improving the protection of people and the environment from the consequences of any accidents.

AQ Directive Adopted

European Environment Ministers formally adopted the first "Daughter" Directive under the Air Quality Assessment and Management Directive on 22 April. The Directive, which must be implemented within two years of its formal adoption, sets limit values for sulphur dioxide, oxides of nitrogen, particulate matter (PM_{10}) and lead, with the aim of avoiding, preventing or reducing their harmful effects on human health and on the environment as a whole. The Directive requires action programmes to be drawn up where it is likely that limit values will be exceeded and for information to be made available. Where air quality is already below the limit value, it should not be allowed to deteriorate.

A proposal for a second "Daughter" Directive covering benzene and carbon monoxide was published late last year. This proposes a limit value of 5 $\mu g/m^3$ for benzene to be achieved by 2010 and 10 mg/m^3 for carbon monoxide to be achieved by 2005. Progress on this draft Directive is however likely to be delayed as a result of the resignation of the European Commissioners in March and the June elections to the European Parliament.

Acid Rain

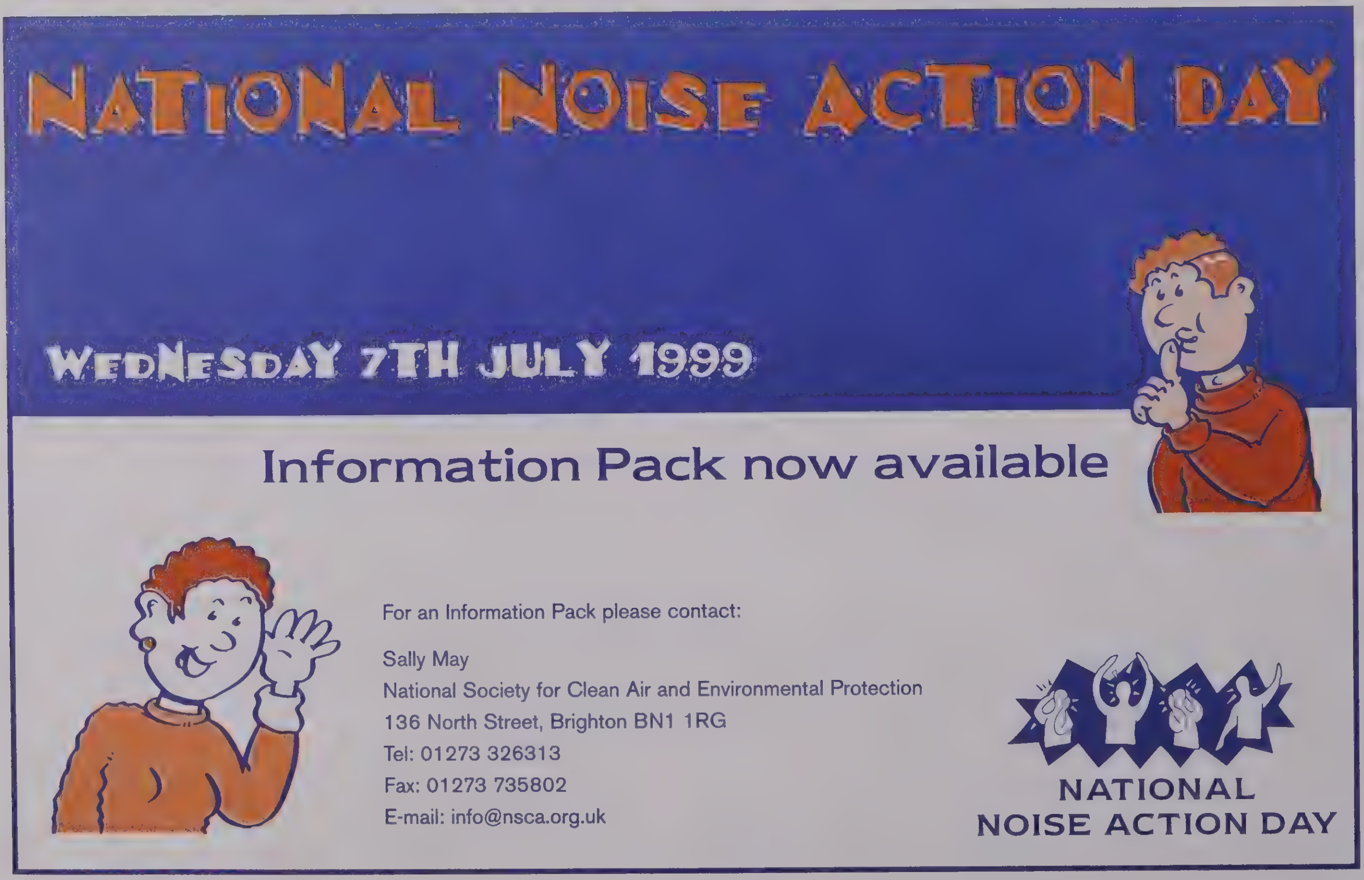
DETR has published a new information booklet on acid rain which explains the problem in a scientifically rigorous, but easily understandable way. The booklet outlines the UK's role in helping to develop new international agreements in both the UNECE Convention on Long Range Transboundary Air Pollution and in the European Community for reducing emissions of sulphur dioxide. The booklet also explains how individuals can help to reduce emissions of sulphur dioxide by, for instance, saving energy and using public transport.

The booklet, which is free, is intended for the general public, in particular interested non-experts - e.g. policy formers in government, pressure groups and industry, the media and those in education. Copies can be obtained from DETR Free Literature, PO Box 236, Wetherby L23 7NB.

Casella is 200!

Environmental consultants, Casella Ltd, celebrated their bi-centenary in March this year. Founded in London in 1799, Casella's first customers included Charles Darwin and Dr. Livingstone. Casella's early product ranges of meteorological, navigation, photographic and medical research instruments have expanded considerably to include automatic weather stations, photometers and real time acoustic measurement systems.

As well as being one of the first companies to support NSCA's activities by sponsorship and advertisement in 1924, Casella recently helped with the publication of NSCA's History *Clearing the Air*, which celebrates a mere 100 years of activity!



NATIONAL NOISE ACTION DAY

WEDNESDAY 7TH JULY 1999

Information Pack now available

For an Information Pack please contact:

Sally May
National Society for Clean Air and Environmental Protection
136 North Street, Brighton BN1 1RG
Tel: 01273 326313
Fax: 01273 735802
E-mail: info@nsca.org.uk

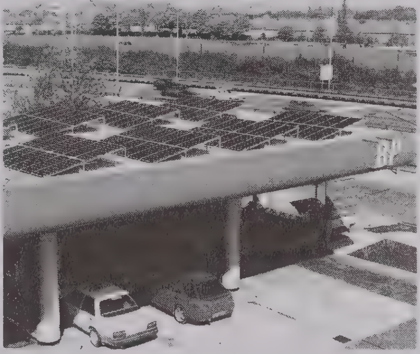
NATIONAL
NOISE ACTION DAY

Members News

Members! Are we covering your news? Please check that your press office has *Clean Air* on its mailing list.

Greenergy have launched an Emissions Estimator to help fleet managers identify the best mixture of fuels and vehicle technology to deliver environmental improvements. The system uses data from a current fleet and calculates emissions of key pollutants. This can then be compared with estimated emissions from changes in engine technology and alternative fuels. Chairman Andrew Owens says "The aim is to create an effective tool for fleet managers with an interest in balancing environmental concerns with the demands of business". Information on 0171 976 1655.

BP Amoco is installing 3.5 megawatts of solar panels on canopies at 200 of its service stations worldwide. The company, which is already one of the world's largest manufacturers of solar cells, will become one of the world's largest users of solar electricity. A 40 kilowatt solar system will also be installed at new office buildings at BP's Sunbury site. Information on 01932 762535.



Edinburgh Council has launched a City Car Club in partnership with Budget Rent a Car. Members can book the car they need with as little as 15 minutes notice, and pick it up from one of four street parking stations. Membership costs £99 a year, but the scheme eliminates the cost of servicing, insurance, depreciation and MOTs, whilst offering secure parking and a range of vehicles (small cars up to people carriers and vans) depending on need. Cllr David Begg, seen below, comments: "We have three main targets - to reduce car mileage, to reduce demand for on-street parking and to ensure there is cheaper access to car use for everyone". Information on 0131 469 3562.

The Minister for Social Security Angela Eagle (below) was clearly influenced by her time as a junior Minister at DETR. The **DSS** Departmental fleet is now claimed to be the greenest in Whitehall, with 27 LPG fuelled cars. This will rise to 200 next year.

Research by the **AA** suggests that drivers could save up to 1p a mile and cut emissions by converting to Liquid Petroleum Gas (LPG). As part of a series of tests on alternative fuelled vehicles, the AA tested a petrol-LPG dual-fuel Vauxhall Vectra and concluded that it offered the economy of a diesel engine, with lower particulate and NOx emissions. However the bi-fuel version costs £700 more to buy, so a typical pay-back period would be two years. Information on 01256 20123.

Books & Reports

Environmental Sampling after a Chemical Accident. *John Houston. The Stationery Office, May 1999. £27.50.*

Commissioned by DETR to provide guidance on best practice on post-accident sampling procedures to assess the extent and nature of environmental contamination, particularly in relation to those sites covered by the Control of Major Accident Hazards Regulations. The types of accident covered are spills to land and water, releases of gas or fume and fires.

Getting Real: The Business of Sustainable Development. *Edited by Christopher Sheldon and Philip Sutton. Special issue of Greener Management International. Issue 23, £25.00. Available from Greenleaf Publishing, Tel: 0114 282 3475; Fax: 0114 282 3476.*

Business research associated with sustainable development is examined and what it means for the commercial organisations of the future. The papers are firmly focused on practical experience in the field and, though all the authors acknowledge the tentative nature of their findings, all describe significant movements from rhetoric to practical action. The papers in this isue of GMI demonstrate that sustainable development is coming of age. For industry, what has been an ill-defined idea is now changing into a rite of passage, and as a result something solid is emerging from the fog of hyperbole.

Buying into Greener Transport. *Business in the Environment in association with the Chartered Institute of Purchasing and Supply. Available from CIPS Bookshop, Tel: 01780 756777.*

Practical guide aimed at procurement managers to help business reduce environmental impacts from transport - in particular the 68% of managers of commercial fleets who (according to a recent report from the Energy Efficiency Best Practice Programme) have not yet taken steps to reduce fuel consumption. The guide highlights the questions - based on transport performance with cost-saving implications - which procurement professionals should be asking of their suppliers. The guide illustrates that some key companies are committed to improving the impacts from freight transport, driven by issues concerning increased fuel costs, business risks posed by traffic congestion as well as the environmental and health threats.

A Guide to EC Environmental Law.

Dorothy Gillies. Earthscan, 1999. £19.95. ISBN 1 85383 585 4.

Clearly written and straightforward guide to the EC and its institutions, it also explains the EC's rather complicated law-making procedures and the stages at which lobbying can be used to influence the content of future EC environmental laws. It also summarises the main environmental laws relating to air and noise, chemicals and industrial risks, nature conservation, waste and water. Part III of the Guide demonstrates how we can use EC environmental laws to protect the environment, dealing inter alia with making a complaint to the Commission, getting help from MEPs, and making a complaint to the European Ombudsman.

Urban Regeneration in Britain: the 1998 URIB© Directory. *The Planning Exchange (Tontine House, 8 Gordon Street, Glasgow G1 3PL). July 1998. ISBN 0905011 72 4.*

Fifth edition of this Directory which lists, with contact names, all the organisations and agencies active in urban regeneration and development throughout Great Britain, together with brief details of schemes underway. Also included for the first time are the Round 4 Challenge Fund SRB Partnerships in England, and currently available details on the structure and remit of the Regional Development Agencies which came into being in April 1999.

The EIC Guide to the UK Environmental Industry 1998. *Environmental Industries Commission. ISBN 0 9525608 3 6. Faversham House Group Ltd, 1998.*

Detailed profiles of companies at the cutting edge of environmental technology and services. Quick reference matrix aids in identifying relevant suppliers as well as the other products and services each supplier can deliver.

What Every Manager Needs to Know About Environmental Law. *Pinsent Curtis (Solicitors). £45.00. ISBN 1 902375 04 1. Chandos Publishing (Oxford) Limited in association with The British Library, 1998.*

Excellent "first stop" advice on IPC and local air pollution legislation, statutory nuisance, environmental assessment, waste and contaminated land and packaging recovery requirements, which are all covered in a mere 107 pages. Regulatory and legal requirements are concisely but clearly set out.

Waste Management: Legal Requirements and Good Practice for Producers of Waste. *Clifford Chance (Solicitors).£45. ISBN 1 902375 05X. Chandos Publishing (Oxford) Limited, 1998.*

This 58pp booklet describes the legal and regulatory obligations of waste producers in concise but clear and non-technical language. As above, excellent, if a little pricey, "first stop" for advice.

Future Events

8-13 AUGUST - Indoor Air 99

8th international conference on indoor air quality and climate, organised by the International Academy of Indoor Air Sciences in cooperation with the International Society of Indoor Air Quality and Climate. Call for Registration of Interest, Trade Fair Exhibitors & abstracts.

Venue: Edinburgh International Conference Centre.

Details: Mrs Claire Aizlewood, Secretary of Indoor Air 99, BRE, Garston, Watford WD2 7JR.
Fax: 01923 664443;
Email: ia99@bre.co.uk

8-10 SEPTEMBER - International Symposium on Non-CO_2 Greenhouse Gases

This second international symposium of the European Federation of Clean Air and Environmental Protection Associations aims to improve scientific understanding, control and implementation measures, focussing on methane, nitrous oxide and fluorine compounds. The symposium is sponsored by IPCC, EU, UN-FAO, IGBP, Eurotrac-2, The Netherlands Ministry of Environment and USEPA. Reduced registration fee for NSCA members.

Venue: Congress Centre, Noordwijkerhout, The Netherlands.

Details: VVM-CLAN;
Fax: +31 73 621 6985;
Email: vvm@wxs.nl;
Website: http://milieuonline.nl.vvm

11-14 OCTOBER - International Conference on Atmospheric Dispersion Modelling

6th International Conference on harmonisation within atmospheric dispersion modelling for regulatory purposes; aimed at model developers and model users, and environmental agencies.

Venue: Rouen, France.

Details: Prof. Alexis Coppalle, CNRS - Université & INSA de Rouen;
Fax: +33 2 32 95 97 80;
Email: Alexis.Coppalle@coria.fr;
Website: http://www.coria.fr

25-28 OCTOBER - NSCA Annual Conference and Regional Conference of IUAPPA

NSCA's Centenary celebrations will culminate in Environmental Protection 99 Conference and Exhibition, with a programme reflecting the fact that it is also the occasion for a Regional Conference of the International Union of Air Pollution Prevention and Environmental Protection Associations.

Venue: Brighton, UK.

Details: NSCA; Fax: 01273 735802;
Email: admin@nsca.org.uk

NSCA Centenary Plate

The National Society for Clean Air and Environmental Protection is the world's oldest anti-pollution group. NSCA was founded in Decemeber 1898 as the Coal Smoke Abatement Society, to tackle the pea-souper smogs which afflicted London and other major industrial cities.

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Friday 23 July
Conference, RSA London
Low Emission Zones & Cleaner Fuels

Tuesday 14 September
Training Seminar - NEC Birmingham
Noise Update 1999

Monday 25 to Thursday 28 October
Annual Conference and Exhibition - Brighton
Environmental Protection 99
13th IUAPPA Regional Conference

Wednesday 10 November
Training Seminar - NEC Birmingham
Air Quality and Health

Thursday 25 November
Workshop - London
UK Dispersion Model Users Group

Tuesday 15 February 2000
Training Seminar - NEC Birmingham

March 2000
Spring Workshop

Monday 23 to Thursday 26 October
Annual Conference and Exhibition - Scarborough
Environmental Protection 2000

For further details please contact
National Society for Clean Air and Environmental Protection
136 North Street - Brighton BN1 1RG
Tel: 01273 326313 EMail: admin@nsca.org.uk Fax: 01273 735802

NATIONAL NOISE ACTION DAY

Wednesday 7 July 1999

National Noise Action Day is coordinated by the
National Society for Clean Air and Environmental Protection
with support from the **Department of the Environment, Transport and the Regions**
For more information contact: **NSCA** 136 North Street Brighton BN1 1RG
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This is also, on request, available as an A2 poster.

clean air
and environmental protection

September / October 1999

the bi-monthly journal of the National Society for Clean Air and Environmental Protection vol.29 no.5

- *Apportionment of PM_{10} using ACCU & TEOM*
- *Meteorological Data & Dispersion Modelling*
- *Pollution Deposition at Long Distance*
- *Computer Model for the Dispersion of Odours*

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ENVIRONMENTAL PROTECTION 1999

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Monday 25 to Thursday 28 October 1999
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Managing Air Quality: Taking Stock of Progress
Building Sustainable Communities
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Industry, Energy and the Local Environment
plus four Parallel Technical Sessions

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Non-members Full Registration - £360.00 + VAT

Conference Fees - from 1 October

NSCA members Full Registration - £295 + VAT
Non-members Full Registration - £385.00 + VAT

Environmental Protection Exhibition 1999

Please contact Howard Phillips at Turret RAI, tel: 01895 454546 for detailed information

National Society for Clean Air and Environmental Protection
136 North Street, Brighton BN1 1RG
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The National Society for Clean Air and Environmental Protection produces information, organises conferences and training events, and campaigns on air pollution, noise and environmental protection issues. Founded in 1899, the Society's work on smoke control led to the Clean Air Acts. More recently NSCA has been influential in developing thinking on integrated pollution control, noise legislation, and air quality management.

NSCA's membership is largely made up of organisations with a direct involvement in environmental protection: industry, local authorities, universities and colleges, professional institutions, environmental consultancies and regulatory agencies. Individual membership is also available to environmental specialists within industry, local authorities, central government, technical, academic and institutional bodies.

Members benefit from joining a unique network of individuals who share an interest in a realistic approach to environmental protection policy; from access to up-to-date and relevant information; from reduced fees at NSCA conferences and training events. They contribute to NSCA's regional and national activities; to environmental policy development; to translating policy into practice; to the Society's wide-ranging educational programmes.

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(Founded 1899)
Registered Charity, Number 221026

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Editorial

All Change

It may be true that the only certain thing is change, but sometimes that can be surprisingly difficult to produce, particularly in people's general attitudes and behaviour. However, this is the task which faces us, if we are to have a significant impact on noise and the present noise climate. National Noise Action Day, which took place on 7 July, aims to assist in making this change by raising awareness of noise problems and provides local authorities with a platform to promote their own noise services. This having been said, there is a limit to how much change local authorities can effect on their own. The NSCA Noise Survey 1999 (see this issue of Clean Air), published on Noise Action Day, has found that the majority of chief EHOs believe that the long term solution of neighbour noise problems lies not in regulation and prosecutions, but in mediation and education. If these are to have an effect then there must be a wider community involvement in addressing the selfish behaviours (on both sides of the fence) which cause so many noise complaints.

Wider community involvement in decision making and policy development is at the heart of Local Agenda 21 and sustainable development. The growing importance of sustainable development at the local level and the policy integration which it demands are the driving forces behind the NSCA Innovation in Local Sustainable Development Awards, launched earlier this year. The entries are currently being assessed and the announcement of the winners will be made at the Annual Conference in Brighton in October, which this year also hosts a Regional Conference of IUAPPA, the International Union of Air Pollution Prevention and Environmental Protection Associations. NSCA would like to thank all of those local authorities who have entered for the awards.

Another change which local authorities are having to make is in the serious consideration of consultation and the use of community participation to develop action plans and policies. The publication in August of the NSCA How To Guide - Consultation for Local Air Quality Management tries to help air quality managers with their duty to consult and, hopefully, to save time and resources in the long run. What is clear, however, is that local authorities can't improve air quality on their own - we all need to get involved and "do our bit".

The publication of the Draft Revised National Air Quality Strategy was also expected in August; this will, no doubt, contain a number of significant changes to the original, produced two years ago. NSCA gave a detailed response to the results of the review of the first Strategy in April and will be seeking members' comments for a similar response to the new draft. Comments should be sent to Tim Williamson at the Brighton Office or by email to twilliamson@nsca.org.uk.

NSCA is certainly not immune from change and has seen much in its 100 year history. The editorial team for *Clean Air* has expanded with Loveday Murley becoming the Production Editor and Tim Williamson taking over the job of Commissioning Editor. While there are some changes planned for the journal, for example the development of a discussion page for members to air their environmental protection problems and solutions, the editorial team would very much like to hear if you have any suggestions for how *Clean Air* should be taken into the next Millennium. The new century will, after all, provide an excellent opportunity to change.

NSCA Awards for Innovation in Sustainable Development

Innovation in

Sustainable Development

To mark its centenary, NSCA is promoting an award scheme, sponsored by the Petroleum Industry Association, to recognise exceptional contributions by Local Authorities to the advancement of innovation in sustainable development.

80 entries have been submitted for the 1999 awards, in the following categories:

- Sustainable Transport and Air Quality
- Environmental Health and Sustainability
- Implementing Sustainable Development

Award winners will be announced at the NSCA Conference in October.

---

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National Society for Clean Air and
Environmental Protection

Noise Update 1999

The annual national seminar for noise control officers and others with an interest in noise policy and practice.

Tuesday 14 September 1999
NEC, Birmingham

- UK Policy Overview
- Noise and Health
- Noise Education
- Industrial Noise Management
- Entertainment Noise
- Transport Noise
- Mediation in Noise Disputes
- Road Noise

For a brochure and further information contact NSCA on 01273 326313

NSCA News

NATIONAL NOISE ACTION DAY 1999

National Noise Action Day, on 7 July, saw over 200 local authorities, along with schools, mediation and community groups, all over the UK participating in raising awareness of noise issues at local level. Several authorities crushed confiscated equipment, while Bristol donated theirs to a local technical college. Other authorities worked with schools, launched new services and promoted keyholder registration for intruder alarms. NSCA published the annual national survey of local authorities (summary in this issue - see next item).

Environment Minister Michael Meacher attended an exhibition organised by Westminster City Council at Whiteley's Shopping Centre in Bayswater, London. The event, which was hosted by Westminster City Council and co-ordinated by the Noise Network, included exhibition stands by NSCA, Westminster Noise Team, HSE, Noise Network, the British Tinnitus Association and Mediation UK. Mr. Meacher highlighted the effects of too much noise in our daily lives and the need to be aware of how much noise we were making and ensure it was not a problem for others. He said that Noise Action Day provided a helpful focus and practical tips to cut down noise. Mr. Meacher also drew attention to NSCA's Noise Survey saying that it gave an important insight into opinions for levels of noise complaints, on current legislation, dealing with disputes and on future noise policy. Pictured with the Minister in front of Westminster City Council's Environmental Health 24 hour Noise Team Display are Keith Lester, 24 hour Noise Team Manager, The Rt Hon Peter Brooke, MP for the City of London and Westminster, and The Rt. Worshipful the Lord Mayor of Westminster, Cllr Alex Segal.

The day received excellent coverage on TV, radio and in the press at both national and local level. NSCA undertook 17 national, regional and local media interviews, including ITN News, the Today Programme, The Times, World Service and the Jimmy Young Show, through to Radios Cumbria, Kent, Gloucester and Humberside.

NATIONAL NOISE SURVEY 1999

Introduction

As noise pollution has become an increasing matter for concern, NSCA has carried out research to gauge the opinions of the local authority officers who enforce current noise control legislation and to inform the debate about future policy development. This survey was sent to all Chief Environmental Health Officers in the UK in May 1999, asking for their opinions on levels of complaint, current legislation and dispute resolution and future noise policy. Results for England, Wales and Northern Ireland were analysed separately from Scotland, where legislation and procedures differ.

A copy of the full survey results can be obtained from Sally May at NSCA in Brighton (email admin@nsca.org.uk)

England, Wales, Northern Ireland - Main Findings

An overwhelming 80% of local authorities would welcome a National Noise Strategy, to give greater coherence to the way noise problems are tackled. It is clear from the survey that many are finding informal means of resolving disputes effective. There is also a strong impression that many noise complaints are symptomatic of wider problems. Many officers believe that as our capacity to make noise has increased, so tolerance has decreased - 'privatisation of lifestyle' as one respondent put it. While 72% feel that better education on noise issues is the way forward, only 15% currently carry out any educational work as a matter of routine. However nearly half participate in National Noise Action Day. This suggests that resources need to be targeted at more proactive education work.

Complaints

Method of Recording Complaints

There has long been a wide variation in methods used by local authorities to record noise complaints. In 1997, following the recommendations of a Government working party on noise, the Chartered Institute of Environmental Health published a noise management guide, which presents a standard method for recording noise complaints.

Our survey found that currently only 31% of responding authorities use this method of recording, and several had not heard of it. The majority are happy with their own established systems of recording and/or have computer systems that cannot accommodate the recording method.

Number of Complaints

As we are aware of the disparities in complaint logging, we ask officers dealing with noise to identify, in their opinion, the most common causes of complaint.

Neighbour Noise - Amplified music remains the main source of complaint for 65%, followed by barking dogs for 52%, televisions the third most common for 24% and DIY for 18%.

Other Sources - Pubs and clubs are by far the largest source of complaint - in the top three for 90% - followed by construction for 60% and industry 51%. It is interesting that traffic, the most prevalent source of environmental noise, generates a low number of complaints to local authorities. This may be because people are aware that environmental health officers cannot tackle this problem, a perception that nothing can be done about it or a perception that it is central government responsibility. Only six authorities gave traffic noise as their most common source of complaint.

Research looking into current awareness and perceptions of traffic noise would be useful.

Change in the Number of Noise Complaints Over the Last Year

Neighbour Noise

For 44% of respondents complaints about amplified music are increasing. While this is a significant number, it is only half the number who reported an increase in 1997. Also, a higher proportion of local authorities are reporting a drop in general neighbour noise complainants. This could indicate:

- following the expansion of noise services in local authorities over recent years we are now establishing the true extent of the problem;
- current services are at saturation point and cannot deal with any more complaints; or
- the message is getting through.

Other Sources

Complaints about pubs and clubs are increasing at a slower rate than in previous years - however nearly half of responding authorities still report an increase. Forty-two per cent report decreasing complaints about industrial noise. Half of responding local authorities report a decrease in complaints about traffic noise. Again, this is interesting in the light of widespread concern about traffic and transport issues.

Further work is needed to establish the reason for these trends.

Legislation and Enforcement

Officers Responding to Noise Complaints

There is still a wide disparity in the way in which officers are deployed to deal with noise. To some extent this can be explained by the differing demands between urban and rural areas.

This highlights an area where a National Noise Strategy might be helpful in providing models for best practice.

Night Time Noise Services

Two thirds of local authorities have some form of night time cover. The type of cover varies - in most cases authorities adjust the service according to demand and resource allowances. The proportion with no officer on duty to respond to night time complaints has increased. Of the 26% with no night cover, about half say that night time noise is not a major problem. The proportion with 7 day, 24 hour cover has also increased to 28%. This could reflect the differences in demand for the service in different areas and/or differences in prioritisation of resources. Out of hours staff are primarily those working in environmental health, who are accustomed to dealing with the public.

Night time noise remains a problem for 78% of local authorities.

Noise Act 1996

Since our last survey only two more responding local authorities have adopted the Noise Act, making a total of ten. It is reported to have been used four times. Ninety-four per cent are unlikely to adopt it - the main reasons are that their existing service is adequate and the prescriptive provisions of the Act do not justify the resources required; the Act is due to be reviewed in summer 1999.

However, the powers of confiscation under the Environmental Protection Act 1990, which were clarified in the Noise Act, are seen as a useful tool.

The Crime and Disorder Act only came into force in April, but has already been used by six local authorities.

We look forward to the outcome of the review of the Noise Act.

Mediation

Forty-six per cent of local authorities have used mediation in dispute resolution. Fifty-two per cent think mediation is a more effective means of resolving disputes and 36% that it improves community relations - as it can resolve the underlying issues that are often behind a noise complaint and address areas where a problem exists, but statutory nuisance does not apply. Mediation is mainly carried out by independent mediation services - and local authorities also see this as an advantage in dispute resolution. Mediation UK would like to see an increase in local authority use of mediation services and properly trained mediators. In this way noise disputes can be settled early on thereby preventing further, more serious, deterioration in neighbour relationships.

There is a majority opinion that mediation is an effective way of resolving noise complaints - which are often symptomatic of wider disputes.

Future Noise Policy

Reasons for complaints

Higher expectation of quiet, incompatible lifestyles with neighbours and selfish attitudes are still perceived as the main reasons for increasing noise complaints. Seventy-one per cent feel the public have unrealistic expectations about noise. The general feeling can be summarised by one respondent - 'If neighbours actually talked to each other, it would be nice'.

Seventy-two per cent feel that the way forward is better education on noise issues compared with only 30% who want more prescriptive legislation. Only 15% currently carry out any sort of proactive education on noise issues, but about half participate in National Noise Action Day.

It is clear that more resources need to be directed to proactive education on noise and related issues.

Nuisance Legislation

The majority say that existing legislation on noise is adequate and that nuisance provisions are still appropriate as they allow flexibility in dealing with different noise environments. However, many feel that there is a gap between public perception of nuisance and the legal definition. Complaints are often resolved informally, without resorting to the law. Many experience difficulty in gathering evidence to prove nuisance, and cite justified cases for complaint which do not constitute a nuisance.

Local authorities are content with the nuisance provisions, but clarification and better education of the public on what constitutes a nuisance would be welcomed. More weight should be given to informal resolution.

Noise Mapping

Noise mapping is the subject of draft EU legislation; it addresses ambient noise levels - mainly traffic. Currently complaints about traffic noise to local authorities are falling. This could be because people do not think anything can be done about it. Currently about a third of local authorities are considering noise mapping.

A National Noise Strategy?

Eighty per cent of responding local authorities would welcome a strategy that would give greater coherence to policy and action on noise. Many expressed the reservation, though, that it should not be too prescriptive, allowing for the very different noise climates and problems in urban and rural areas. Some felt a national strategy could not adequately address what is in many cases a very localised problem.

There is a need for a national strategy for noise, to provide more coherence in approach while allowing flexibility in addressing local issues.

Conclusions

From the above it appears that levels of increase in complaint are rising at a slower rate. In some areas complaints have levelled out or dropped. This may be an indicator that we have reached a higher level of awareness of the noise problem, there are more effective noise control services in those areas - or that noise simply isn't a big problem there. However, there is a general perception overall that we are noisier and more selfish, and expect to do be able to do what we like and not be interfered with by others - we are experiencing 'privatisation of lifestyle'- according to one respondent. These opinions lead towards the conclusion that noise is not the core of the problem - it is social attitude. In addressing this, education is believed to be important but hardly used. For many, more guidance on approaching noise problems would be welcome. While nuisance is still valued over prescriptive measures (as demonstrated by poor uptake of the Noise Act), there is a gap between public expectation and what is enforceable in law.

These are all issues that a National Noise Strategy can address.

Scotland

The Scottish results showed that noise complaints in Scotland appear to be rising at a higher rate than in the rest of the UK. Like the rest of the UK, the Scots believe that better education and informal resolution are the way forward in resolving noise disputes, and support the development of a National Noise Strategy.

AIR QUALITY MANAGEMENT - PROGRESS AND PROSPECTS

The fact that NSCA's most recent AQM seminar (held at the NEC, Birminaham on 24 June) had the highest attendance of any in recent years is an illustration that local authority officers and air quality practitioners still have a great deal of enthusiasm for local air quality management. The day divided into three parts, with the first half of the morning given over to DETR feedback on the progress of the review of the National Air Quality Strategy and local authorities' review and assessment of air quality. Chris Leigh of DETR informed the seminar that the revised National Air Quality Strategy could be expected in January 2000, the date being pushed back from December this year to avoid Christmas. The consultation draft of the Strategy was due in the Summer. Stephanie Coster covered the progress of local authorities in terms of review and assessment, with 90% now having submitted their Stage One report. The main causes for concern were, not surprisingly, SO_2, NO_2 and PM_{10} and the vast majority of authorities have moved on to Stage Two for one or more of these. During the question session at the end of the morning, the issue of the deadline for the completion of review and assessment was raised. Local authorities who felt that they were not going to complete by the end of 1999 were encouraged to write in to DETR.

Duncan Laxen (Air Quality Consultants) is part of the team monitoring local authority reviews and also co-wrote, with Steve Moorcroft (Stanger Science and Environment), the recent advisory document on reviewing and assessing PM_{10} in the light of the EU Daughter Directives. He introduced his presentation by stating that PM_{10} was dead, which almost brought a cheer from the audience. However, he went on to caution that the measurement technique must be included with the results of any monitoring so that we now have $PM_{10(TEOM)}$ and $PM_{10(Gravimetric)}$, the latter being the units of the Daughter Directive.

The second morning session looked at Air Quality Management Areas (AQMAs), with Tim Brown (NSCA) summing up the general policy issues and emphasising that, regardless of whether they declare an AQMA, local authorities should have a local air quality strategy. Mike Morris from solicitors Nabarro Nathanson advised local authorities what they could expect from the judicial review process. The main message was that the courts will usually support the authority, as long as it acts reasonably, and within the law, in the discharge of its duties. Gavin Tringham (Birmingham City Council) rounded up the session by looking at the declaration of AQMAs from a practical standpoint. He cautioned that, before the boundaries of an AQMA are drawn, officers should pay close attention to the uncertainties in modelling data and to the way in which the data were compiled. For example, traffic data are often represented by straight "links" whereas in reality roads bend considerably. This could lead to the model putting a major road a significant distance from its actual location, with dramatic consequences for the modelled results.

The afternoon session looked at advice and guidance on local air quality management. Jeff Bishop of BDOR Consultants launched the NSCA document *Consultation for Local Air Quality Management: The* How To *Guide* which was published in its final form at the end of July. The guide covers the principles and practice of consensus based consultation and includes some practical examples of where these techniques have been used and have worked. The guide will be distributed free to all local authorities and will subsequently be available for sale from NSCA.

The second guide, *Air Quality and Land Use Planning* produced by the RTPI, was introduced by Mike Bull of Ove Arup and Dr Elizabeth Street of Kent County Council. The document provides an introduction to Local Air Quality Management for planners and explores ways in which the planning system and LAQM can be more closely integrated. The guide is available from the RTPI, 16 Portland Place, London, W1N 4BE; tel. 0171 636 9107.

The final presentation of the day came from Jane Choke of the Transport Research Laboratory, who gave an overview of TRL's current research programme. One of the areas TRL is exploring is the effect certain traffic management measures and policies can have on local air quality. While the work is still ongoing, TRL have found that measures which on the face of it should provide significant help, do not always do so. The general conclusion is that a range of measures will always be more effective than relying on one or two.

Also launched at the seminar was the University of the West of England's *Local Air Quality Management: A Best Practice Guide* by Clare Beattie and Prof. James Longhurst of the Air Quality Research Group. The guide covers all aspects of LAQM but concentrates on information dissemination, education and cooperation within and between local authorities and with other agencies. It is available directly from UWE, AQM Resource Centre, Coldharbour Lane, Frenchay Campus, Bristol BS1 1QY, or via the Internet at www.uwe.ac.uk/aqm/project/bpg.html.

LOW EMISSION ZONES: Reducing the Environmental Impact of Vehicles in Urban Areas

The second report by the NSCA Cleaner Transport Forum, launched on 23 July at the Royal Society of Arts in London, addresses the question of low emission zones. (Their first report, Cleaner Air: the Role for Cleaner Fuels, was published in February 1998.) Many local authorities are currently considering the options for tackling areas of poor air quality, particularly in city centres. One option is to create low emission zones (LEZs) which seek to reduce emissions from road vehicles by encouraging the use of cleaner vehicles, or reducing the number of vehicles overall. The Government's Cleaner Vehicles Task Force has identified LEZs as an important area for further research.

The NSCA Cleaner Transport Forum put together a research partnership, including interests from the oil and motor industries, retailers, freight distribution, local authorities, public transport, research consultancies, environmental groups and Government Departments, to investigate the potential for LEZs to contribute to improving air quality.

The objective of a LEZ is to reduce vehicle emissions, in a given area, in order to improve local air quality. So the criteria for LEZs are likely to include geographic and temporal boundaries, air quality objectives, vehicle emission standards, and transport management measures. Selected categories of vehicle could be restricted or prioritised through a range of measures. Action to improve traffic flow and reduce vehicle numbers overall would also contribute to reducing emissions.

The report opens the way for local authorities to create low emission zones in town centres by encouraging the use of cleaner vehicles, or reducing the number of vehicles overall. LEZs can be created by traffic regulation orders, which allow local authorities to exclude certain types of vehicles from specific areas in the interests of pollution control. They could also include voluntary agreements or licencing arrangements with fleet operators, buses and taxis.

LEZs could be enforced by traffic wardens or local authority officers. Vehicles would need to carry a certificate, number plate or licence disc to confirm their emission standards. Under the 1995 Environment Act, local authorities are required to review air quality in their areas, and to develop plans to tackle pollution hotspots. LEZs are likely to be used by local authorities as part of these Air Quality Action Plans.

A summary of the report is included as an insert to this edition of Clean Air. The full report *Low Emission Zones: Reducing the Environmental Impact of Vehicles in Urban Areas* is available from NSCA, 136 North St, Brighton BN1 1RG, price £25 inc p+p.

ENVIRONMENTAL PROTECTION 1999
25-28 October, Brighton

This year the NSCA annual conference returns to Brighton. We also play host to a regional meeting of the International Union of Air Pollution Prevention and Environmental Protection Associations, so the conference will have an international flavour with speakers from around the world. Topics include regional and local air quality issues, environment and the countryside, sustainable development, consumer policy, industry, energy and local environmental management.

For the first time the conference will see the presentation of awards to local authorities for innovation in sustainable development. Competition for the three awards has been fierce, and we anticipate that the winners' presentation will be made by an Environment Minister.

The Environmental Protection Exhibition will also feature major environmental service providers. For a full copy of the conference programme, please contact NSCA on 01273 326313 or email admin@nsca.org.uk.

PROBLEMS WITH PARTICLES

NSCA's second Occasional Paper, *Problems with Particles*, is now available. In this paper, Dr. R.L. Maynard, Senior Medical Officer at the Department of Health, examines some of the problems facing researchers and policy makers as they look for solutions to what is now one of the most urgent air pollution issues of the day.

The Occasional Papers series has been inaugurated in NSCA's Centenary year with the purpose of promoting wider access to key contributions to environmental science and policy. *Problems with Particles* is free to members, £10 to non-members.

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IUAPPA

To mark NSCA's Centenary, this year's annual conference has also been designated the 13th Regional Conference of the International Union of Air Pollution Prevention and Environmental Protection Associations (IUAPPA). As such, the conference will open with a Lecture by Sir John Houghton, former chairman of the RCEP, on Climate Change; Sir John is being honoured by IUAPPA for his work on climate change with its Christopher Barthel Award which is awarded to individual's whose work has furthered the cause of international air pollution control.The opening session of the annual conference will focus on regional air pollution issues with speakers from Israel, France, Canada, the UK, as well as the Chairman of the Convention on Long Range Transport of Air Pollution. Speakers from IUAPPA members have also been invited to contribute to a parallel session which will look at developments in science and practice.

The need for national governments - and organisations - to cooperate across boundaries has assumed even greater importance in the light of the need to look for urgent solutions to today's global environmental problems of ozone depletion, climate change, as well as desertification and deforestation. IUAPPA, which was founded in 1964 and now has 37 members representing 39 countries has defined its mission as: "to promote progress in the prevention and control of air pollution, the protection of the environment and the adoption of sustainable development, by promotion of scientific understanding, the development of skills and techniques, and the application of relevant and effective policies at national and international level". It does this mainly through the sponsoring of triennial world congresses and regional conferences - see box for a list of forthcoming events, and where possible by providing support - both financial and skills transfer - for organisations in developing countries. A recent example of the latter was a workshop on hazardous waste management held in Mutare, Zimbabwe, organised with the help of NSCA member Tameside MBC, with whom Mutare is twinned. In addition the Fund has been used to ensure that organisations in developing countries who are just starting out on the road to effective pollution control legislation have access to IUAPPA's book *Clean Air Around the World: National and International Approaches to Air Pollution Control*. This charts the experience of countries in both developed and developing countries in using both statutory and voluntary pollution controls.

IUAPPA's most recent initiative is the establishment of an awards programme entitled "Hopes for the Future" and which is run in collaboration with the International Academy of Sciences. Awards are given for work undertaken within any theoretical framework, intellectual context or cultural context which helps promote the transition to a sustainable world. These awards, which are presented every three years in association with IUAPPA world congresses, are uniquely forward-looking in their aim to give increased momentum and support to successful work in progress as well as achievements to date. All papers presented at IUAPPA's world and regional conferences are eligible for consideration; winners receive a medal and certificate and an invitation to return to a subsequent world congress to report progress in their work.

NSCA, as one of the founder members of IUAPPA has always played a central role in IUAPPA's development and since 1977 has provided the Union's secretariat. NSCA's Secretary General, Richard Mills, is also IUAPPA's Director General.

Forthcoming events

11th Regional Conference: Environmental Impact Assessment
Prague, Czech Republic: 11-14 September 2000

12th Regional Conference
Lima, Peru: November 2000

12th World Clean Air Congress: Greening the New Millennium
Seoul, Korea: 26-31 August 2001

13th World Clean Air Congress
Israel: 2004

For further details, contact Loveday Murley, IUAPPA,
136 North Street, Brighton BN1 1RG
Email: iuappa@pavilion.co.uk

Reports

SOURCE APPORTIONMENT OF PM_{10} UTILISING AUTOMATIC CARTRIDGE COLLECTION UNIT (ACCU) AND TEOM SYSTEMS IN NEATH PORT TALBOT

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Background

The background to this study is the review and assessment of air quality as required by Part IV of the Environment Act 1995. A detailed emissions inventory indicated that there might be a significant problem with PM_{10} in the Taibach/Margam area of Port Talbot. This was confirmed by continuous monitoring data from the Automatic Urban Network site in the area at Groeswen Hospital. These data, when coupled with wind direction data, enabled the production of pollution roses that showed that the highest average PM_{10} levels occurred when the wind was blowing towards the residential area from a large significant local source in the west and south-west, i.e. a steel works.

The Council is carrying out a stage 3 assessment of PM_{10} in this area with a high probability that an Air Quality Management Action Area (AQMA) will need to be declared. It has therefore become clear, that in order to be able to proceed sensibly to an action plan and attempt to meet Air Quality Objectives, identification of the contribution of PM_{10} from specific sources would be required.

Initial fingerprinting studies were carried out in partnership with Exeter University and, at an early stage, an Air Quality Management Working Group was formed with the works and the Environment Agency to enable constructive dialogue to take place.

Method

An Automatic Cartridge Collection Unit (ACCU) was used in conjunction with a pre-existing Tapered Element Oscillating Microbalance (TEOM) to collect samples onto standard 47mm filters. The objective was to collect samples according to eight standard wind directions, which would subsequently be analysed to help in PM_{10} source apportionment. The ACCU was configured to receive the air from the TEOM that is normally bypassed to waste. The PM_{10} head on the TEOM requires 16.7 litres of air per minute for proper functioning. However, the TEOM only uses 3.0 litres per minute so the remainder of the air is normally wasted. The ACCU system is configured to use this air as shown in Figure 1.

The ACCU unit contains eight filter holders that are connected to the inlet air via individual solenoid valves. The opening and closing of these valves is controlled by the TEOM controller, which can be programmed by the user.

The TEOM controller accepts a wide variety of different types of input as criteria for controlling the ACCU system. Examples of the inputs available include date/time values (e.g. day, month, year, hour, minute, second), mass concentration values, meteorological inputs etc.

Each of the filter channels (1 - 8) is assessed in turn according to between two and four of these criteria. If the selected input is between a specified minimum and maximum, and if any other optional criteria are also fulfilled, then the solenoid valve opens and that channel is active. Only one channel can be active at any one time and assessments are made every 10 seconds. The TEOM controller records the sample time (seconds) and sample volume (litres) for each active channel.

The size range of particles that can be collected on the ACCU filters is considered to be approximately in the range 0 - 7.5 microns. This is due to the configuration of the tubing that takes the input air to the ACCU unit. This size range can be further sub-selected to $PM_{2.5}$ by fitting an impactor on top of the ACCU unit.

In this case the ACCU was configured to collect samples according to the eight standard wind directions of north, north-east, east, south-east, south, south-west, west and north-west. This was achieved using the ACCU channel criteria in Table 1.

Results

Problems were initially encountered with the method because no samples could be collected for channel 1 (northern sector) which spans zero degrees. This was due to a previously undiscovered bug in the TEOM controller software. A free fix for this problem is now available from Rupprecht and Patashnick (R&P) for those wishing to use ACCU systems in this manner.

Comparisons were subsequently made of the proportion of the total time for which each filter was exposed. The data logger collects data in 15-minute average chunks, whereas the ACCU system makes decisions every 10 seconds. It might therefore be expected that the relative proportions as measured by both methods might not be identical. The results of this comparison for three samples are shown in Table 2.

For these three sets of samples the average difference between the two methods overall was zero, but the maximum difference for a single wind sector was 6.2%. In circumstances where a particular wind sector has only been exposed for a relatively short period of time, these differences can be quite significant. There is no way of determining which of the two approaches gives the more reliable figure.

All three sets of samples were taken during periods of moderate or high PM_{10} pollution as defined by the DETR air pollution banding system. The samples were analysed at the University of Exeter. Solids were analysed using scanning electron microscopy and energy dispersive x-ray analysis. Ion chromatography was used on the soluble fraction. The filter media were 47mm paper backed by glass fibre (Pallflex Products Corp. Type TX40HI20-WW). This type of filter was found to have sufficient capacity not to block up over a period of about a week of sampling. This type of filter is not as inert as PTFE or Polycarbonate and may not be suitable for some types of analysis. In addition, the filters stuck to the rubber supporting ring during the survey, which left small amounts of filter adhering to the ring. The result is that the filters could not generally be used to obtain an accurate measurement of the total weight on the filter. It is possible that this particular difficulty may be countered by the use of PTFE lining rings to prevent sticking, alternatively different filters might be used.

The results from the first of the above-mentioned samples are discussed below. The samples were collected over the period 15 October 1998 to 23rd October 1998. It is possible to draw some conclusions from the PM_{10} pollution rose for the period - see Figure 2.

This is a typical picture which shows that the average pollution levels are greatest from the west and south-west. According to the data logger, the wind directions over this period were predominantly from the north-west, south-west and south, as shown in Figure 3.

The filters showed iron flyash to be ubiquitous and strongly biased to the west and south-west. These particles constituted up to 80% of the insoluble particles, by particle count, and had a size range of 0.2 to 3 μm with a heavy skew towards the fine end. These particles are spherical and would appear to have arisen from one or more combustion sources. There were also angular iron particles present, but to a much lesser extent, these being more typical of iron derived from stockpiles. Overall, this would point to combustion, rather than stockpiles as being the major influence - Figure 4.

The relative percentage of insoluble particle types do not include soot particles. However, an assessment of the relative proportions of soot particles were recorded using a scale of 1 to 7, reflecting very light (1) to very heavy (7) deposits on the filter. The reason soot was not included in the particle count was because of difficulties in counting individual soot particles. A feature of such material is that it is typically present as a vast number of ultra-fine particles, 0.1 to 0.2 micron in diameter. These can occur either as discrete particles or agglomerate of chains and clusters. Chains have been observed up to 10 microns in length. It should be noted that the mass of one such 10 micron particle is equivalent to the mass of 1,000,000 x 0.1 micron particles of the same material (DOH, 1995; Stone, 1997; Merefield, 1997).

This methodology makes it possible to draw conclusions about soot loading that was generally light, but showed a bias towards the north-east in the direction of the M4 motorway. This fact suggests that soot loading is not a significant factor, since the pollution rose shows the greatest mass contributions are from the west and south-west.

It should be noted that the size data from particle characterisation shows a typical cut-off at approximately 4 to 5 microns. This is smaller than the 7.5 microns specified and substantially finer than the cut-off for PM_{10}.

The water soluble particulate matter included sulphate, chloride and nitrate, which are typically found in corresponding magnitudes. The soluble anions are reported as weights (mg), with the assumption that each anion is stoichiometrically balanced with calcium, sodium and ammonium cations respectively and concentrations ($\mu g/m^3$).

The sulphate results show a greater predominance from the south and south-west in terms of weight, whilst chloride and nitrate are present at significantly lower levels. Concentration data is unreliable for eastern sectors because of minimal sampling times which result in samples being near the method detection limit. With the exclusion of the samples in the eastern sectors, the typical range of concentrations in the south, west and north are: sulphate, 1.5 to 5.6 $\mu g/m^3$; chloride, 0 to 3.5 $\mu g/m^3$; nitrate, 0.1 to 0.6 $\mu g/m^3$ - Figure 5.

Conclusions

The similarity between the PM_{10} pollution rose and the results of the iron flyash components suggest that this may be the predominant source of pollution in the vicinity of the monitoring equipment. Further work will be carried out in order to attempt to distinguish between the flyash particles that arise from sources in the western area. Further attempts will also be made to fully quantify the various components by weight in order to get a more definitive picture of the extent to which soot and soluble ions contribute to the total mass measured.

It is felt that the combined techniques of PM_{10} pollution roses coupled with the use of the TEOM and ACCU systems are a potentially significant contribution to source apportionment of environmental samples. With this approach the targeting of Air Quality Management Action Plans can be improved.

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Merefield J.R, Stone I, Barron J. and Jones J. 1999. Techniques for tracing fugitive mineral dusts for nuisance control and health risk. Read at Extractive Industry Geology Conference, Exeter, July 1998. In press, *Transactions Institution of Mining and Metallurgy*.

Moorcroft S, Laxen D, Stedman J, Vawda J, Conlan B. and Abbott J. 1999. Assistance with the review and assessment of PM_{10} concentrations in relation to the proposed EU Stage 1 Limit Values. Stanger Scientific & Environment for DETR. 23 pp plus tables and annex.

Table 1. ACCU Channel Criteria

	ACCU	ACCU FILTER CHANNEL							
CRITERIA	SETTINGS	1	2	3	4	5	6	7	8
Min	Wdir (Degrees)_	338	23	68	113	158	203	248	293
Max	Wdir (Degrees)_	22.5	67.5	112.5	157.5	202.5	247.5	292.5	337.5
3rd	Null	-	-	-	-	-	-	-	-
4th	Null	-	-	-	-	-	-	-	-

Table 2. Comparison of Logger and ACCU Wind Directions

WIND	COLLECTION PERIOD								
	09/10/98 to 15/10/98			15/10/98 to 23/10/98			23/10/98 to 30/10/98		
	ACCU	LOGGER	DIFF	ACCU	LOGGER	DIFF	ACCU	LOGGER	DIFF
N	17.3	11.7	5.6	12.9	10.7	2.2	10.5	7.0	3.5
NE	0.4	0.3	0.1	3.0	2.7	0.3	0.2	0.2	0.0
E	0.7	0.5	0.2	2.4	2.5	-0.1	0.2	0.2	0.1
SE	2.7	2.9	-0.2	13.0	12.8	0.2	2.9	4.3	-1.5
S	2.8	3.0	-0.3	20.3	21.3	-1.0	3.2	1.9	1.3
SW	11.6	15.9	-4.3	20.0	23.1	-3.1	12.1	18.1	-6.0
W	14.8	9.6	5.1	10.1	5.2	4.9	22.2	18.6	3.6
NW	49.9	56.0	-6.2	18.3	21.7	-3.4	48.7	49.8	-1.1

Figure 1.

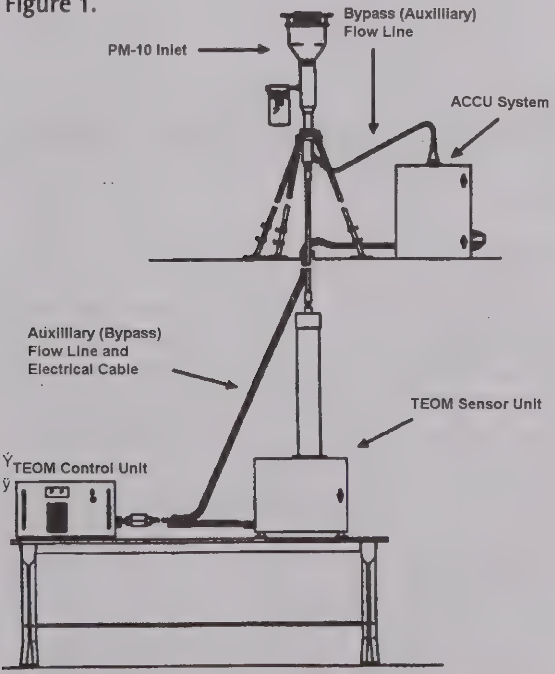

Bypass (Auxiliary) Flow Line
PM-10 Inlet
ACCU System
Auxiliary (Bypass) Flow Line and Electrical Cable
TEOM Sensor Unit
TEOM Control Unit

Figure 2. PM_{10} (µg/m³) by Wind Direction

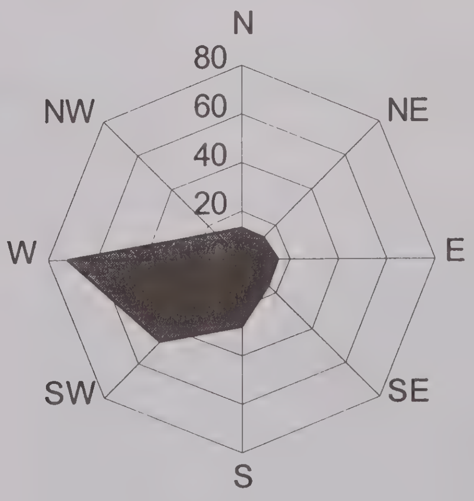


Figure 3. 15 min Samples by Wind Direction

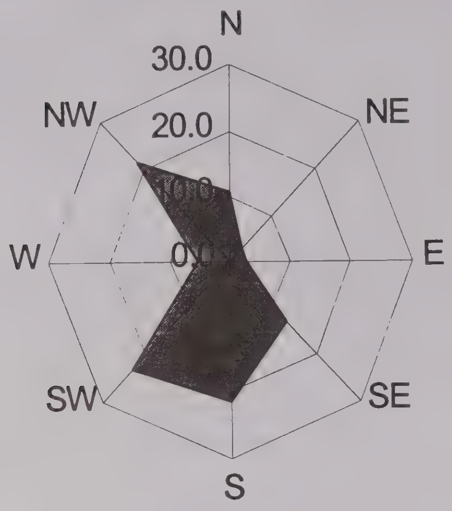


Figure 4. Iron Particles (% Count)

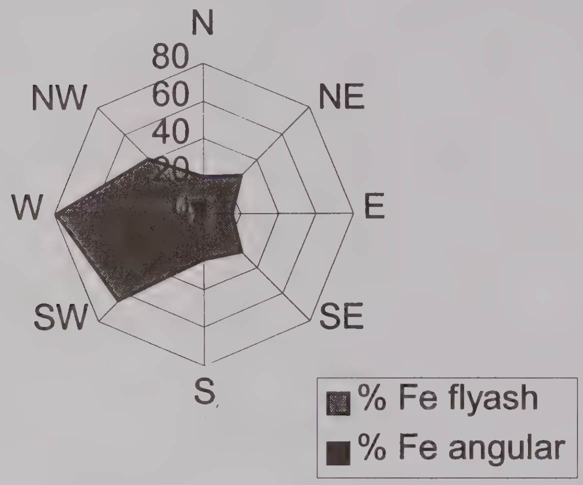
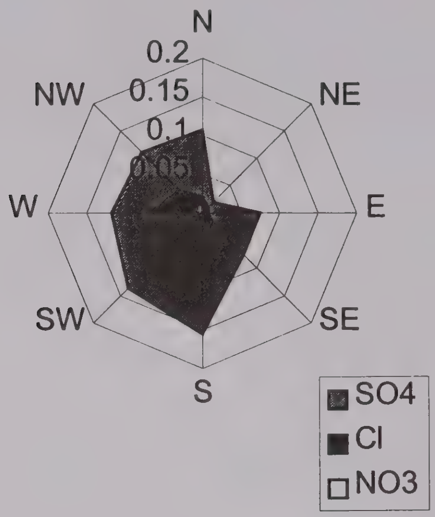


Figure 5. Soluble Components (mg)



METEOROLOGICAL DATA AND DISPERSION MODELLING

David Hall, Angela Spanton

Envirobods Ltd

There are two main sources of meteorological data for dispersion modelling in the UK. These are the UK Meteorological Office and Trinity Consultants Inc. No particular distinction is made between the use of data from these two sources, though they are not identical. This note discusses these differences and the effects they may have on dispersion calculations.

Introduction

Dispersion modelling for regulatory purposes in the UK usually requires estimates of pollutant ambient concentrations and deposition covering a variety of criteria, for example human exposure, ecosystem damage and nuisance (DOE, 1996; Review Group on Acid Rain, 1997). Emissions and discharge stack heights have to be controlled to remain within these limits. Most of these criteria are based on annual statistics of some sort, both annual averages and a variety of upper bound statistical limits, such as 98%ile and maximum hourly values for nitrogen dioxide and a 99.9%ile 15-minute hourly maximum for sulphur dioxide. Obtaining these statistics requires dispersion calculations on an hourly basis, using hourly weather data, over a whole year, 8760 calculations in total. There may also be a need to carry out calculations for several individual years in order to account for year-to-year variations in pollution statistics.

The dispersion models that are most commonly used for these calculations in the UK are the USEPA ISC model, its UK equivalent the R91 model, the newly arrived (and technically more advanced) USEPA AERMOD model and the UK ADMS model (which is similar in character to the AERMOD model and has been in use in the UK for some years). They all require hourly meteorological data in special formats (different in each case) which has to be processed from the raw data obtained from the meteorological site of interest. This is then processed further within the models in order to provide the parameters specifically required for dispersion calculations. The most important of these meteorological parameters are wind speed, wind direction, boundary layer height and an atmospheric stability criterion (a Pasquill/Gifford stability criterion for the ISC and R91 models and the Monin/Obukhov length scale for the USEPA AERMOD and UK ADMS models). Wind speed and direction are measured directly at meteorological sites, the boundary layer height and stability criteria are derived from other data, including time of day, solar radiation and cloud cover. The derivation of these modelling parameters, especially the boundary layer height and Monin/Obukhov length scale, is a matter of much study and discussion (see, for example the published papers in the two modelling Harmonisation Workshops - Cosemans and Maes, 1995; Kretschsmar and Cosemans, 1997) and subject to significant variation between different methods.

There are two sources of UK meteorological data processed for dispersion modelling. These are the UK Meteorological Office, which collates data from all the sites, and Trinity Consultants Inc. The latter provide their own versions of the ISC and AERMOD models (amongst others) and have a world wide provision of meteorological data for modelling purposes (as does the UK Meteorological Office). Trinity Consultants data are probably the most commonly used dispersion data in the USA. Trinity Consultants also supply a CD-ROM of UK meteorological data, which contains data for the years 1993-97. This covers about 240 UK sites, including the 75 sites whose data are most suitable for dispersion modelling. Data from the remaining sites, though deficient in some way for modelling purposes, are nonetheless useful for other reasons and the CD-ROM represents the most comprehensive set of UK meteorological data readily available. There is no equivalent data set available from the UK Meteorological Office, who will supply only specific data on request on a fee-paying basis.

The requirements for adequate meteorological data for dispersion modelling are fairly stringent and all essential parameters must be available. Trinity Consultants recommend that there should be at least 90% availability of data over the year and short gaps in data may be filled in by prescribed procedures. There are about 75 UK meteorological sites that can provide data to this standard over long periods. This may seem sufficient, but there is in fact quite sparse coverage over some parts of the country. It is common for these and other sites to be short of data at weekends or of cloud cover information generally.

In the UK there is no proscription on the source of meteorological data for regulatory modelling and there is a division of modelling data users between the two suppliers. Both claim to apply high standards of quality control to their data. Data from Trinity Consultants are significantly cheaper than from the UK Meteorological Office and the constraints on use less onerous, so that it is quite popular. We know of at least two respectable practitioners (who will remain nameless) who use only Trinity Consultants data. The authors use data from both sources and have been interested to note that no consideration has been given to whether their data are in fact identical. It is this, and its effect on dispersion modelling studies that is considered here.

Comparison of Meteorological Data

Figure 1 shows plots of four basic meteorological parameters, wind speed and direction, temperature and cloud cover, between the Meteorological Office and Trinity Datasets for identical hours in the year for the site at Finningley (near Doncaster) during 1994. Similar results were obtained from single year data at three other sites. Values from the Meteorological Office data are along the abscissa, for the Trinity data along the ordinate. The solid line is the 1:1 line. It can be seen that there are differences between the two data sources, though in fact most of the data lies close to the 1:1 line. It has to be remembered that there are 8760 points plotted on each graph and in fact most of the data points overlay one another close to the 1:1 line. Some statistics of the comparison are given in Table 1, below. The resolution given for the measurements is the worst value from either data source. The final two columns give the number of samples within twice the resolution.

It can be seen that, except for cloud cover, the frequency of equal values of the parameters is relatively low. However, most of the hourly data values agree to within twice the resolution of the data. This is the minimum difference required to remove the effects of 'digitising' the data within the limits of resolution. Figure 1 also has broken lines either side of the 1:1 line corresponding to plus and minus twice the resolution of the data.

The largest differences between the two data sets are of wind speed and direction and there is a reason for this. The data provided by Trinity Consultants are obtained from the US National Climatic Data Centre (NCDC), which collates meteorological data worldwide. They have also, in cooperation with the USEPA, developed procedures for supplying data suitable for dispersion modelling (Beychok, 1994, p.153). NCDC-based data are thus the standard source of meteorological data for dispersion modelling in the USA. Their format for wind speed and direction data is to take the average values over the first ten minutes of each hour. In comparison, wind speed and direction from Meteorological Office data are averaged over the full hour. The NCDC's choice of data format seems to be mainly related to maintaining continuity of data with earlier (and, in many cases, still current) methods of collecting meteorological data by hand. The usual method of doing this is to record the meteorological parameters at the start of each hour, during which task a measurement of wind speed and direction is recorded over the first ten minutes of the hour.

It must be appreciated that this latter method of recording wind speed is not necessarily inferior to taking a full average over the hour. Indeed, it is probably advantageous in assessing some wind speed parameters, such as the frequency of occurrence of extreme wind speeds. Nor is it statistically significant that some of the sample is lost, as long as there are sufficient numbers of sampled data points to determine any required parameter. In the present case there are nominally 8760 samples in both data sets, which is adequate for determining most air pollution parameters. The main meteorological distinction between the two data sets is the averaging time used. A 10-minute averaged wind speed can be expected to show a greater variability than an hourly average since the wind is more unsteady in speed and direction in the shorter term. This should not affect a calculation of the annual mean wind speed, but might show a higher value of, say, the 98%ile. The additional variability can be predicted approximately by a number of methods and depends on several meteorological factors including wind speed, height above the ground and atmospheric stability. However, a rough order of the standard deviation of the additional variability in six 10 minute means within a given hour would be of the order of 1-8% in wind speed and 0.3°-3° in wind direction against values of the hourly mean.

Some statistics of variation in temperature and wind speed between data sets from the two sources are shown in Table 2. There are no differences between any statistics of temperature. The wind speeds show some differences. The annual mean wind speed from the Trinity data set is about 3% higher than from the Meteorological Office data set and the standard deviation of the wind speed from the Trinity data set is 5% higher than from the Meteorological Office data set. These differences are consistent with the arguments over averaging times above, but are small compared with the year-to-year differences that often occur. The small differences between the higher order statistics, the skewness and kurtosis, are not significant.

Figure 2 shows bar charts of wind speed in five categories for 30° wind sectors, for the two data sources, again for Finningley 1994, together with data for one additional year, 1993, for Meteorological Office data. It can be seen that there are slight differences between the two data sources in this example, but that differences between Meteorological Office data for 1993 and 1994 for the site are significantly greater than between the two data sets for 1993. Closer inspection of the 1993 data from the two sources shows that in the lowest wind speed band, Trinity Consultants data show overall slightly lower wind speeds than that of the Meteorological Office. In the highest wind speed band, the opposite occurs, the Trinity Consultants data show slightly higher wind speeds overall. This is consistent with the greater variability in wind speed that might be expected with a 10-minute averaging period against one hour.

Dispersion Calculations from the Two Meteorological Data Sets

In view of the possible uncertainties in dispersion calculations due to these differences, we have carried out some sample dispersion calculations, using emission data consistent with a large power station with a stack of 200m height and a heat release from the stack of about 300MW. Dispersion calculations from larger, higher discharges of this sort tend to show greater effects from changes in the boundary layer characteristics (derived from the meteorological data) than from sources at lower heights. The dispersion model used was UK ADMS, versions 2.2 and 3. The meteorological data was for Finningley, 1994, as in the meteorological data comparison above.

Figures 3, 4 and 5 show calculated concentration contour maps of, in turn, annual average, 99.9%ile and 100%ile concentrations. Each Figure shows a plot from using each combination of UK ADMS Version 2.2 or 3 with Meteorological Office or Trinity data for Finningley, 1994, as discussed above.

Table 3, below, gives the maximum values of the annual mean and 100, 99.9, 99, 98 and 95 percentiles for these cases. Table 4 gives the position of these maxima in each case. The ratios between values using different models and between different versions of the model shown in Table 3 are given in Table 5. A bar chart of the data in Table 5 is shown in Figure 6.

The contour maps in Figures 3-5 mostly show broadly similar distributions of the concentration contours though, as these and Tables 3-5 show, there are differences due both to the meteorological data and the version of ADMS used. Table 5 shows that most of the values calculated using the four combinations of model and meteorological data are within 25% of one another. It is also clear that variations between the two different versions of the dispersion models are as great as those between the two different sets of meteorological data. The greatest differences between both models and meteorological data are in estimating the 100%ile concentration between ADMS versions 2.2 and 3 and (for no reason that is clear) the 95%ile concentrations. Overall the Trinity Consultants meteorological data and ADMS v 2.2 produced the highest concentrations, but not consistently.

Figure 6 also shows a bar chart of ratios of concentrations calculated for 15 minute and hourly averages in the dispersion model. This difference is mainly of interest due to the 15 minute averaging time required for the EPAQS 99.9%ile short term sulphur dioxide limit. The effect of the shorter averaging time has to be calculated within the dispersion model from the dispersion calculation based on hourly data. There are again differences between the variations in model and meteorological data, though with different patterns to those of the hourly data. The 99.9%ile, the parameter of greatest interest, shows a relatively small variation between different models and meteorological data.

Figure 7 shows a plot of the percentile concentrations at the point of maximum annual mean concentration for the four combinations of data and model. All the curves follow the same trend, with the greatest differences at the 100%ile and 95%ile values. There is a marked rise in concentration at the 100%ile value using ADMS v.2.2, which is greatest with Meteorological Office data.

It must be noted that some of the differences between the calculations noted above are related not to the dispersion calculation directly, but to the model's interpretation of the meteorological data, which in turn affects the dispersion calculation. Figure 8 shows a plot of the differences in boundary layer height calculated by versions

2.2 and 3 of the ADMS model. About 9% of the values exceed a difference of ± 50m.

Discussion and Conclusions

The two sources of meteorological data investigated here show differences, partly due to the definitions of wind speed and direction used, though both claim to apply high standards of quality control. However, the comparison also shows that a high proportion of the differences are within the limits of resolution of the data and of the 'digitisation' that causes a measurement to be placed within a specific range band, of wind speed and direction for example. It must also be noted that year-to-year differences in meteorological data are significant and will generally be greater than between the two data sets for the same single year.

These differences between the two sources of meteorological data are large enough to affect dispersion calculations with the dispersion model used here, UK ADMS, differences in the upper bound percentiles of interest in air pollution studies being significantly greater than the annual means. However, the differences in calculated concentrations between the two most recent versions of UK ADMS , versions 2.2 and 3, are of the same order and in some cases greater than those generated between the two different meteorological data sets. It must be noted in this context that the recent transfer from version 2.2 to version 3 of ADMS seems to be largely passing without any major interest being shown in any differences of calculation that may exist between them. This particular model is not alone in this matter and it may be regarded as surprising that such matters are not taken more seriously.

The final question that must be asked therefore is whether there is any reason why either source of meteorological data should not be used for dispersion modelling studies. There would seem to be two arguments. Firstly that present UK preferred standard practice is to use Meteorological Office hourly data. If so this is not promulgated anywhere and amounts to a form of proscription, which the regulatory authorities are keen to avoid. Secondly, that the nature of the Trinity Consultants data, using a 10-minute average at the start of each hour, is statistically less satisfactory than full hourly averages as supplied by the Meteorological Office. The statistical differences between the two meteorological data sets, discussed above, in fact seem relatively small compared with other sources of error in the dispersion modelling chain. In practice these differences between the data sets should have little effect on annual average dispersion calculations, as seems to be the case here. Calculations of upper bound percentiles show more variability, but this is in any case a problem associated with this type of estimate, which is more uncertain than an overall mean. Meteorological data based on ten minute averages should in principle provide a more accurate way of estimating the 99.9%ile 15 minute mean EPAQS SO_2 limit, as its 10-minute averaging time is closer to the 15 minute mean required than an hourly average. However, the other upper bound concentrations of interest, for NO_2, are hourly averages for the 100%ile and 98%ile.

This brief investigation shows clearly enough that all sources of meteorological data are not the same and that both the choice of dispersion model and of meteorological data affect the resultant dispersion calculation. Whether these differences should be regarded as critical is arguable and the authors' view is that they mostly lie within what might be called the 'noise' of modelling. That is, we are here approaching the limits of accuracy of present modelling methods. Part of the problem may be that advanced dispersion models such as UK ADMS or AERMOD are more sensitive to meteorological data than the older simpler models. Given the uncertainty in all collected meteorological data and the relatively large year to year differences that occur in the UK, differences due to the choice of meteorological data do not seem particularly critical.

There would, however, seem to be a good case for expecting that modelling studies should quote the source of their meteorological data, along with the type and version of the dispersion model used. At present the latter is nearly always given, the former hardly ever.

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Table 1. Statistics of Meteorological Data Comparison. Finningley 1994

Parameter	Measurement Resolution	No of Hours Values Equal	% of Total	No of Hours Values Within	% of Total
Temperature	±0.5°C	1572	18	±1%C	99.6
Wind Speed	±0.5m s^{-1}	3090	35	±1m s^{-1}	87
Wind Direction	±10°	3511	40	±20°	90
Cloud Cover	±1 Okta	7255	83	±2 Oktas	96

Table 2. Statistics of Temperature and Wind Speed Between Meteorological Office and Trinity Consultants Data Sets. Finningley, 1994.

Statistic	Temperature °C		Wind Speed m s^{-1}	
	Met Office	Trinity	Met Office	Trinity
Annual Mean	9.95	9.95	4.33	4.48
Standard Deviation	5.71	5.71	2.59	2.72
Skewness	2.03	2.04	2.26	2.27
Kurtosis	3.49	3.49	4.35	4.38

Table 3. Maximum Concentrations from the Plots in Figures 3, 4 and 5.
Hourly averaged concentrations in μg m^{-3} for a release of 1 kg s^{-1}.

Model/Met data	Annual Mean	100 %ile	99.9 %ile	99 %ile	98 %ile	95 %ile
ADMS v2.2						
Met Office	0.53	291	49.5	20.4	7.07	1.01
Trinity	0.62	234	64	24.9	9.22	1.33
ADMS v3						
Met Office	0.50	64.6	46.6	19.3	8.97	0.80
Trinity	0.59	66.2	48.1	22.4	12.0	1.29

Table 4. Position of Maximum Concentrations Given in Table 3.

Model/Met data	Coords (km)	Annual Mean	100 %	99.9 %	99 %	98 %	95 %
ADMS v2.2							
Met Office	X	462	460	462	462	468	474
	Y	424	423	424	424	433	440
Trinity	X	462	454	458	462	464	480
	Y	424	427	429	424	423	422
ADMS v3s							
Met Office	X	462	464	462	462	466	474
	Y	424	418	424	424	424	440
Trinity	X	462	462	462	462	468	480
	Y	424	431	424	424	423	422

Table 5. Ratios of Concentrations from Table 3 for Different Model Versions and Meteorological Data.

Model/Met data	Annual Mean	100%ile	99.9%ile	99 %ile	98 %ile	95 %ile
Met Office /Trinity						
ADMS v2.2	0.85	1.24	0.77	0.82	0.77	0.76
ADMS v3s	0.85	0.98	0.97	0.86	0.75	0.62
ADMS v3s/v2.2						
Met Office	0.94	0.22	0.94	0.95	1.27	0.79
Trinity	0.95	0.28	0.75	0.90	1.30	0.97

Figure 1. Comparative Plots of Wind Speed, Wind Direction, Temperature and Cloud Cover, for Trinity Consultants and Meteorological Office Data. Finningley, 1994.

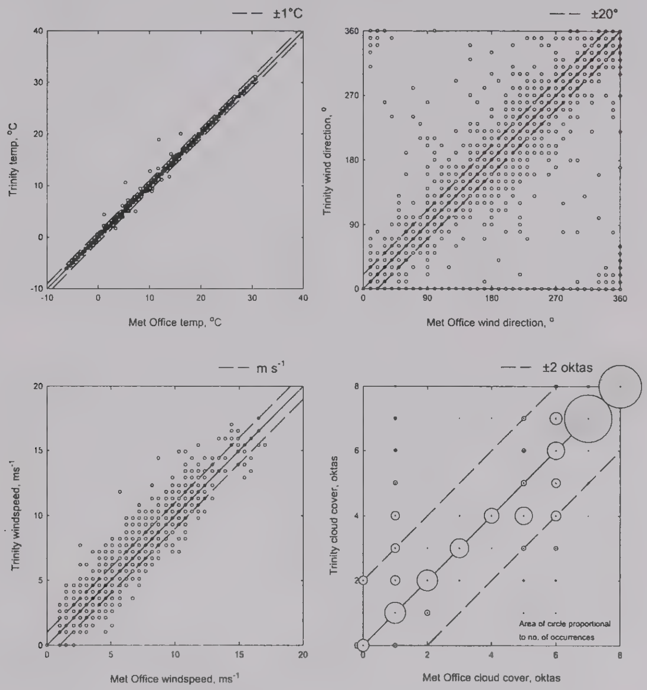


Figure 2. Wind Speed and Direction Bar Charts of Trinity Consultants and Meteorological Office Data. Finningley, 1993 and 1994.

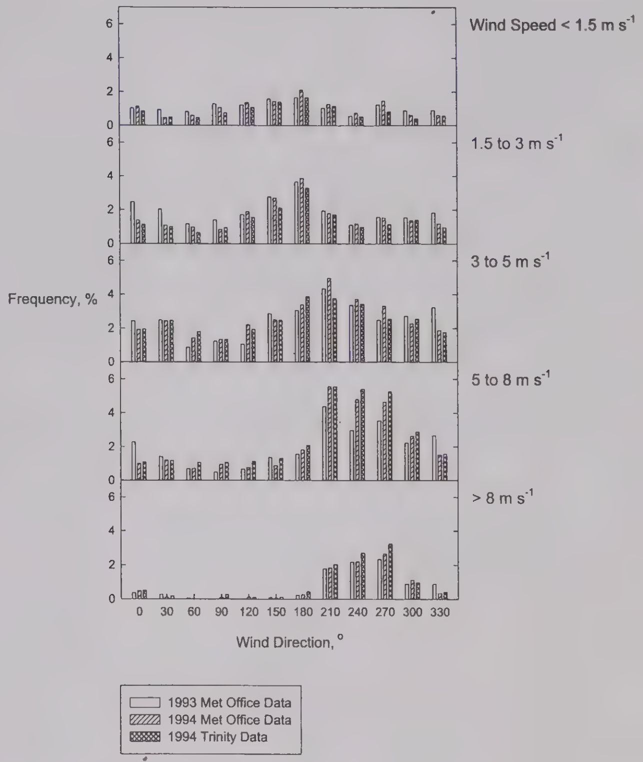


Figure 3. Contour Concentration Maps of Annual Average Concentration for the Two Meteorological Data Sets, Calculated Using UK ADMS Versions 2.2 and 3. Concentrations in µg m⁻³ for an Emission of 1kg s⁻¹.

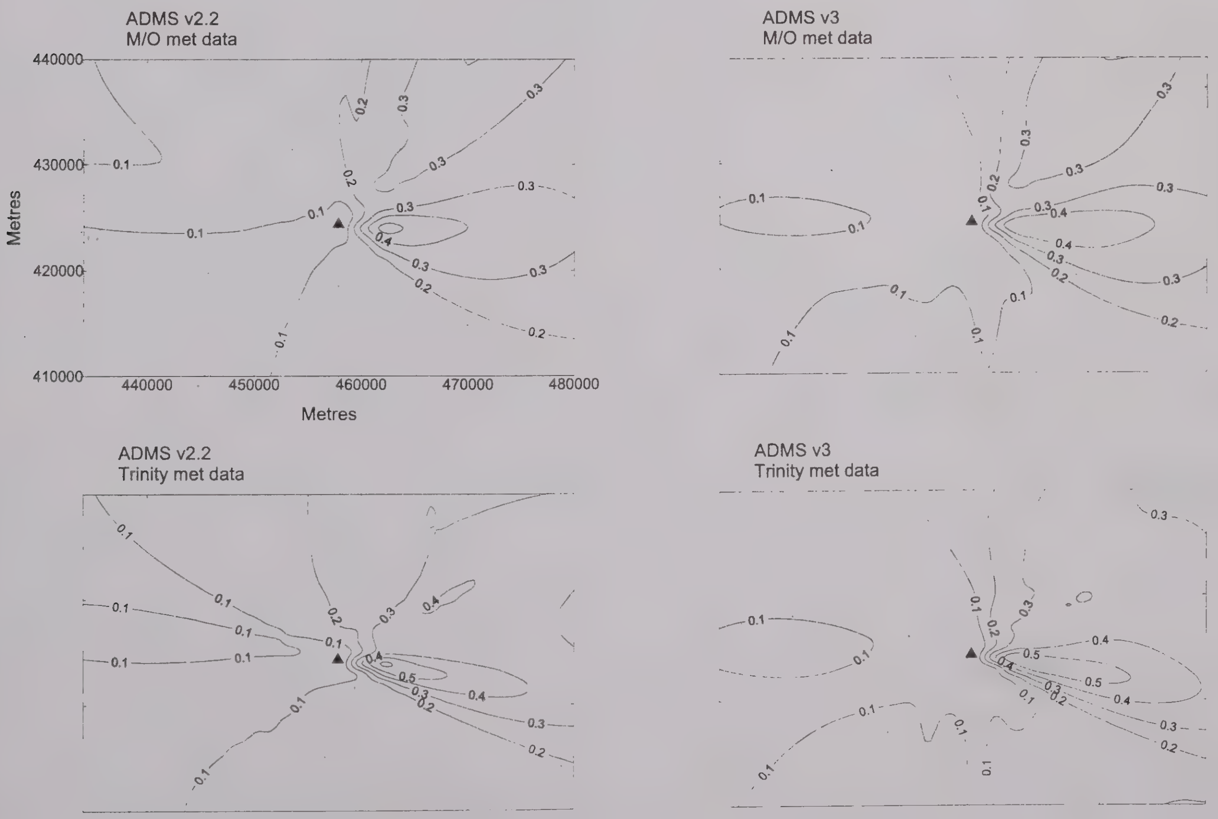
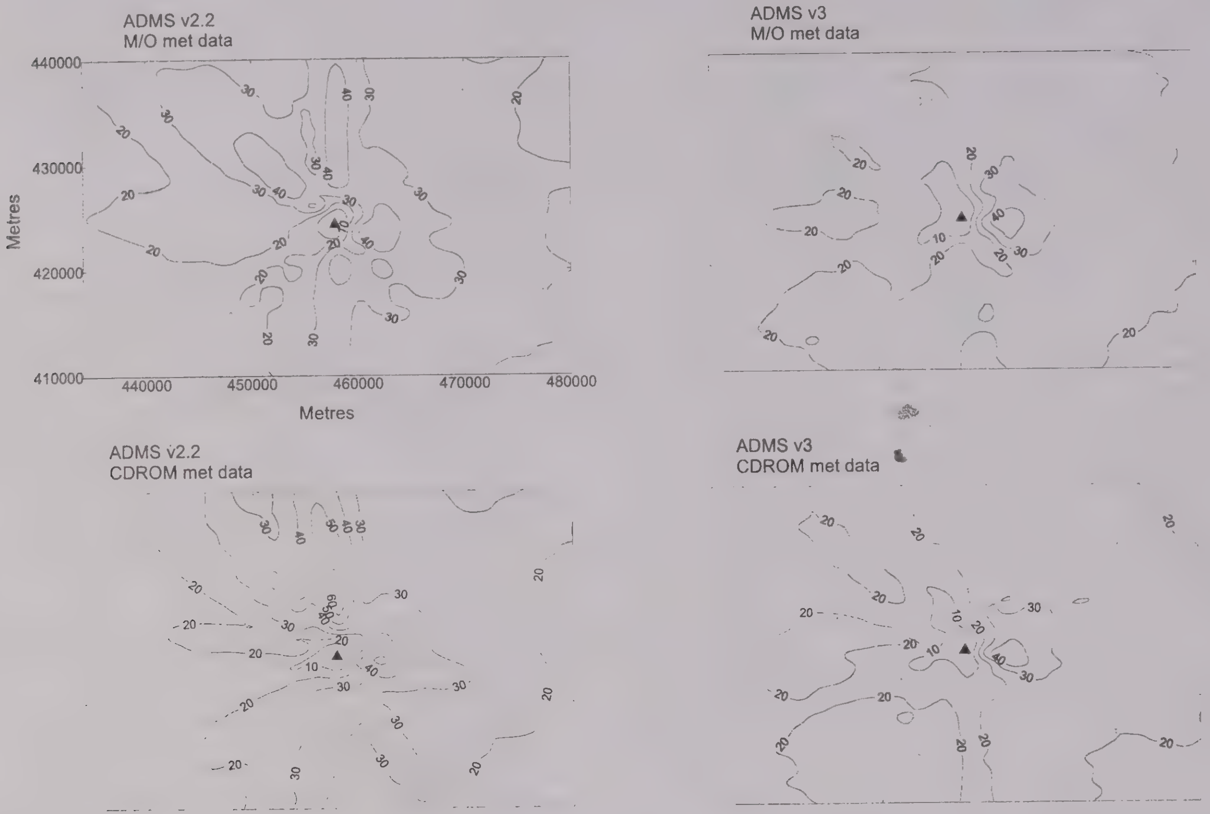


Figure 4. Contour Concentration Maps of 99.9%ile Concentrations for the Two Meteorological Data Sets, Calculated Using UK ADMS Versions 2.2 and 3. Concentrations in µg m^{-3} for an Emission of 1kg s^{-1}.



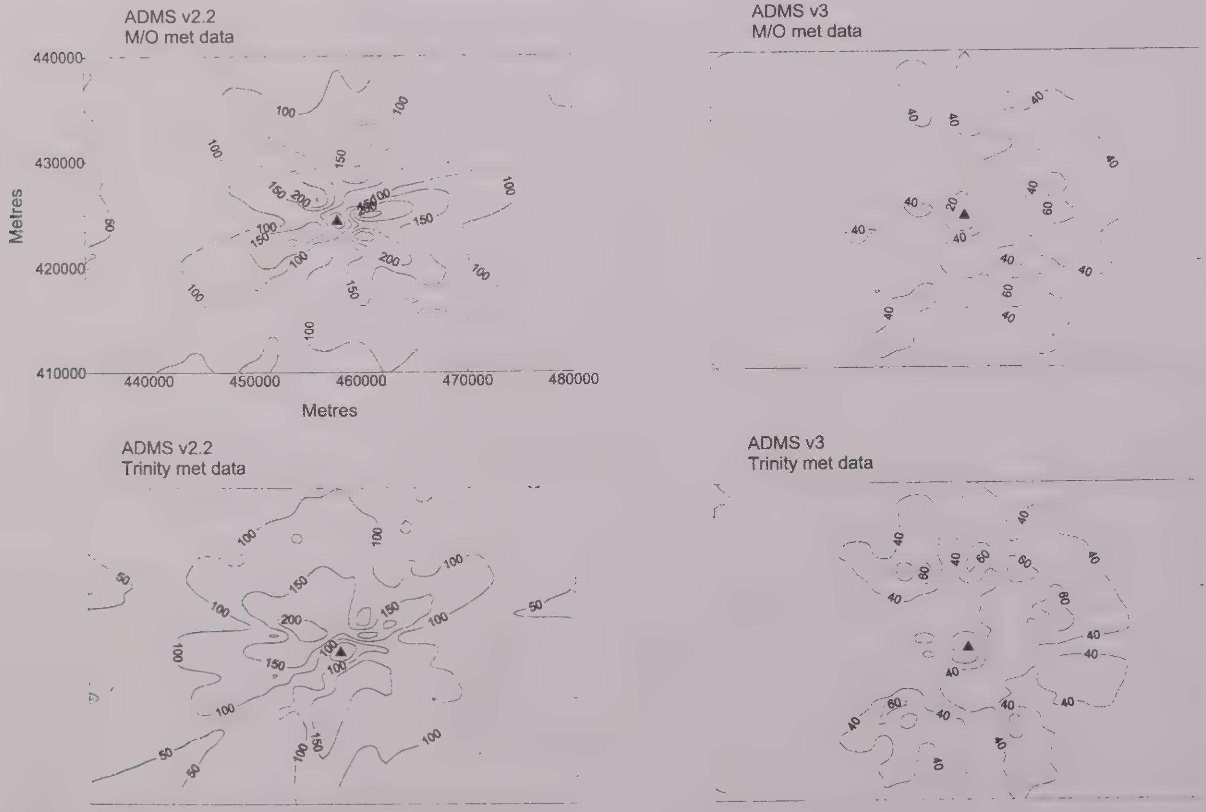
ADMS v2.2 M/O met data

ADMS v3 M/O met data

ADMS v2.2 CDROM met data

ADMS v3 CDROM met data

Figure 5. Contour Concentration Maps of 100%ile Concentrations for the Two Meteorological Data Sets, Calculated Using UK ADMS Versions 2.2 and 3. Concentrations in µg m^{-3} for an Emission of 1kg s^{-1}.



ADMS v2.2 M/O met data

ADMS v3 M/O met data

ADMS v2.2 Trinity met data

ADMS v3 Trinity met data

Figure 6. Bar Chart of the Concentration Ratios in Table 5 for Maximum Concentrations Using Different Combinations of Model and Meteorological Data.

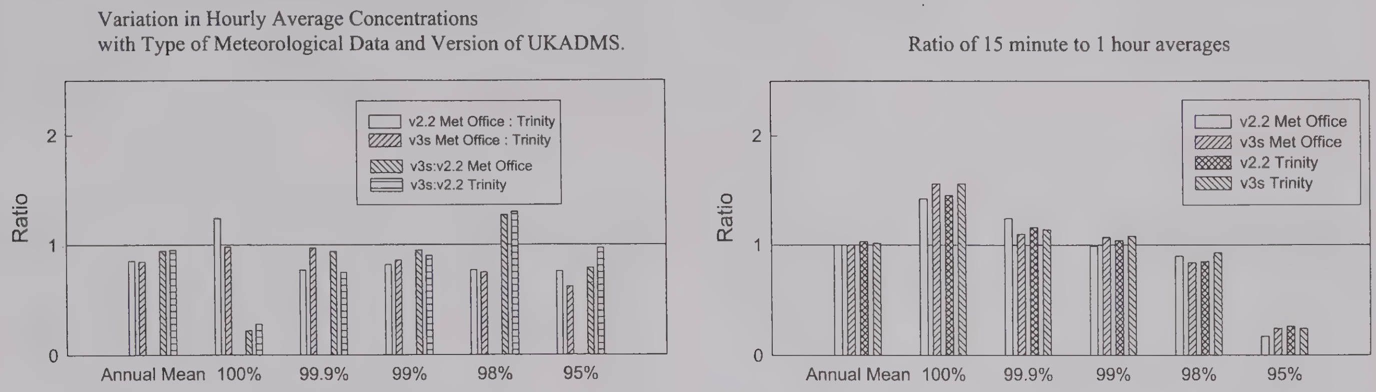


Figure 7. Percentile Plots of Concentration at the Point of Maximum Annual Mean Concentration in Figure 3 Using Different Combinations of Model and Meteorological Data.

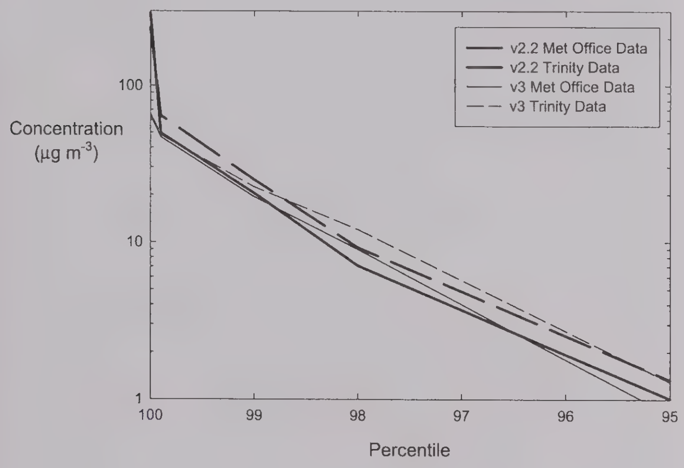
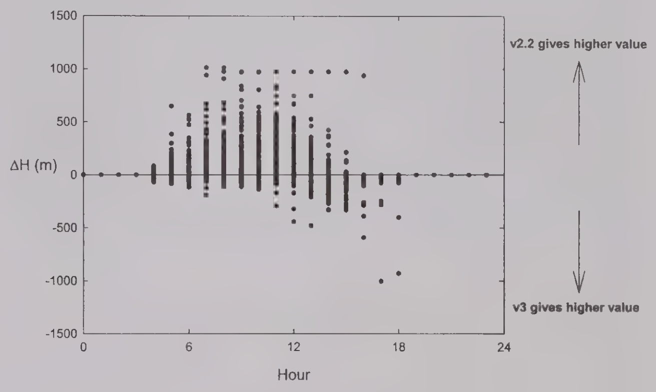


Figure 8. Differences in Calculation of Boundary Layer Height Between ADMS Versions 2.2 and 3. From Finningley 1994 Meteorological Office Data.



POLLUTION CONCENTRATED BY DEPOSITION AT LONG DISTANCE

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Different Dispersion Problems

There are four different kinds of problem which need to be clarified:

1. *Pollution received close to the source;*
2. *Transport across boundaries;*
3. *Accumulation at large distance;*
4. *Global effects on climate due to the overall accumulation in the atmosphere of pollutants that are not effectively removed by natural weather processes.*

This fourth category has become more important in recent years. Type 2 is not usually included in models designed for type 1, but may become a quite different problem in type 3. That is the concern of this essay.

The Importance of General Convergence or Divergence in Determining the Depth of a Mixing Layer

Pollution may travel horizontally with the wind at any stable layer to which it has been lifted either by being carried up a frontal surface; or by thermal convection from the surface as a result of travelling over warm sea or by day over land warmed by sunshine; or by being very hot at the source.

If the convection is violent enough to produce showers the pollution is often washed out by providing the hygroscopic nuclei on which cloud droplets are formed, and it becomes contained in the rain, hail, or snow which deposits it on the ground. But often the upward transport is limited by a stable layer, usually called an *inversion*. This may be the top of a cloud layer, and the strength of the inversion is increased by the cooling due to the infra red radiation from the cloud top. This cooling usually promotes downward convection (and cooling) within a cloud (layer), and it far exceeds the absorption by the cloud of sunshine which is either reflected back into space or is scattered downward from the cloud base.

One other important type of inversion occurs at the cloud base when the convection cloud does not form a complete layer. The stronger thermals from below produce cumulus clouds as they rise through the condensation level but at the same time, the cumulus gradually evaporates because the air around them is not saturated. The result is downward motion to be seen on the outside of the cumulus due to the evaporative cooling as the cloud mixes with surrounding much drier air. There is also a downward motion in the clear surrounding air which compensates the volume of the upward motion in the cumulus. This subsiding air is warmed adiabatically and arrives back at the cloud base level warmer than the air already there and thereby prevents the rise of the weaker thermals through the condensation level. Most of the pollution is therefore trapped below the cloud base which is effectively the top of the mixing layer. Thus haze top is commonly seen from a plane ascending through it to higher levels.

The magnitude of this inversion depends on the amount of *general convergence*. For example, if there is a growth of sea breezes around the coast of Britain, the resulting inflow supplies the volume of the up-currents which are producing the cumulus inland, and so there are no down-currents to compensate for the up-currents, and no inversion is produced at the condensation level. An anticyclone, however, producing a general *sinking*, and *divergence*, of the air mass will greatly intensify the inversion at the condensation level and pollution generated below is trapped and may travel a very large horizontal distance in the upper part of the mixed layer which is now formed.

The heights at which inversions exist and the amount of subsidence or convergence taking place make all the difference in placing the pollution at various levels in the air mass which is carried by the horizontal wind. This is most important in attempts to track pollution back to its source.

Effect of Particle Size; Fumigation

Most pollution is generated by combustion, and is therefore likely to be included in the hotter thermals which reach up to an inversion. Only when they accumulate into a complete polluted layer will some of the pollution be displaced by the thermals rising later. For example, if the thermals cease to be supported in the evening, a layer of strongly polluted air may remain and be carried a large horizontal distance at night without being detected at the ground. If the next day's convection stirs up the mixed layer we experience *fumigation* at the ground.

For this to happen, the fallspeed of the pollution particles must be slow enough for them to "float" in the air for many hours, and if the air containing them is carried over a cool sea or over land covered with snow, the particles will remain in the upper part of the mixed layer for 36 or more hours.

Removal from the Mixed Layer

With sufficiently various fallspeeds, the particles may gradually be spread through the whole depth of the mixed layer. If the layer is then lifted by the airstream passing over a hill they may be deposited directly on the higher ground if the airstream is spread sideways by passing round the humps on unlevel ground, or they may be carried upwards into rain- (or snow-) generating shower clouds. In a variable profile of wind speed and direction, and therefore of stability also, the pollution may come into a shower-producing region and be carried down in the fallout. Yet the particles may be too small to be captured by falling rain below the cloud base.

By mechanisms such as those just described, black snow has been deposited in eastern Scotland, the carbon pollution having been introduced into the air in Silesia, Hungary, Slovakia or somewhere else in Eastern Europe after a quite tortuous route.[1, 3]

The location of sources of black carbon can often be identified as being in a particular region. But the origin of the radioactive pollution from the power station disaster at Chernobyl could not only be identified exactly, but also its trajectory via, Finland, Sweden, Poland, Austria, Bavaria, etc on its way to Ireland, Wales, Scotland, Italy and Greece as the weather systems were seen in satellite images to be continually changing.[4] It is interesting that the back-tracking after the event by meteorologists in the Free University of Berlin showed no improvement in accuracy when air parcels were back-tracked along at constant potential temperature, rather than at constant height. Small sophistications in the modelling do not necessarily lead to improved accuracy in the identification of a source; for this case the source was already known with certainty.

Concentration at Deposition

Sea salt is a form of pollution which is carried into the air on a large scale from sea spray and is subsequently contained in precipitation at warm or cold fronts in mid-latitude cyclones. The same fate may be that of industrial pollution introduced into the warm sectors of these systems over Britain and Western Europe generally. These systems are mentioned because they produce most of the rain and snow falling over mountain ranges.

It may be very difficult to arrange for significant depositions to be measured in routine rain gauges, or to identify such falls in the routinely sampled chemical content of river water. However, snowfall, which may well be deposited repeatedly in the same part of a mountain system, will not release the salts and acids previously introduced in this way into the snow-pack uniformly: during the first few days of the snow-melt in the spring the melt-water usually carries away (into streams) nearly all the salts deposited in the whole of the previous winter.

This first snow melt has often caused kills of trout in Scandinavian rivers which have destroyed the population of that species (but not of other species) at that time; and this has more recently been prevented by introducing limestone or lime powder into the lakes and rivers where the trout was particularly valued, and was threatened by high acidity.

Is Pollution Necessarily Dispersed

We see therefore that modelling for predictive or analytical purposes needs very good evidence of the chemistry and meteorology of the occasion to be of useful accuracy. It illustrates the universal fact that pollution can be eliminated as a risk only by preventing its emission.

Some pollution is carried very large distances with negligible dispersion (dilution), and is then concentrated by the inflow into the base of shower clouds; and this is contrary on both counts to the assumption of continuous dilution.[2,4] The shower mechanism produces more rain than is present in water in the cloud at any one moment, and stationary shower clouds often generate serious floods by processing the vapour (and pollution) of a very much larger volume.

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OMONOS: A COMPUTER MODEL FOR THE DISPERSION OF ODOURS IN THE AIR

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Questor Centre

The Queen's University of Belfast

Introduction

OMONOS is a Windows-based computer model for predicting the likelihood of detecting emissions from single and multiple point and area sources. The model is based on a development of Wilson's plume meandering model[6] and includes enhancements developed by Cheung[2].

Odours - Detecting and Modelling

The emission of odorous material from chimney stacks, vents or ground level sources can lead to smells deemed offensive by the general public. Tightening regulatory controls mean that an awareness of potential odour problems is an important part of many planning applications. The use of an odour model can be helpful at both design and remediation stages to ensure optimum combinations of parameters such as stack height, exit velocity and filtration or scrubber systems, to minimise the likelihood of exposure to detectable concentrations.

As concentrations of an odorous material increase a point is reached, the detection threshold, when the odour is just detectable. Laboratory tests, using panels of trained observers, have been carried out to determine these threshold concentration values for a range of materials. These are commonly reported as the concentration at which one half of the panel can just detect the odour. Threshold data are available in texts by Verschueren[5] and Woodfield and Hall[7].

Why is Odour Modelling Different?

Conventional air pollution models may be used to predict mean concentrations over time periods ranging from a few minutes through days, weeks and even years. However, the time required for a human to detect an odour is of the order of a few seconds and so odour modellers are interested both in predicting the mean concentration over a few seconds and in the fluctuations in concentrations about the mean. Using conventional air pollution models these fluctuations are 'averaged out' and information on peaks of concentration is lost. Time averaged concentrations may show levels consistently below the threshold for odour detection, masking the fact that short term fluctuations may cause peaks above this threshold and therefore the possibility of an odour incident occurring. Odour modellers would like to know if concentrations exceed the detection threshold during some sampling time period and, if so, how often this might occur.

A common scenario is represented in Figure 1 which shows a typical concentration time series measured downstream at a fixed receptor position. The wide and rapid variations in concentration are a consequence of randomly oriented eddy circulation patterns in the air (atmospheric turbulence) acting on the dispersing plume of odorous material. During this time period there is a fraction of time where concentrations are non-zero [γ] and a fraction of time when zero concentrations occur [$1-\gamma$]. The mean concentration [C] is the average concentration for the time period including values of zero concentration while the conditional mean concentration [C_p] is the average excluding values of zero concentration. Both of these time-averaged means may lie below the threshold level for odour detection [C_{th}] but the peak concentrations may exceed the threshold for some of the time period, indicating a potential for odour problems. Taking into account all the factors affecting the concentration fluctuations and the time averaged mean concentrations [including wind speed, atmospheric stability or turbulence and plume rise], and given an odour detection threshold, this odour model predicts the likelihood of the concentration exceeding the threshold value.

What Approach does OMONOS Take?

A number of approaches have been used to model concentration fluctuations including the meandering plume model used by OMONOS. This model recognises the fact that a range of sizes of atmospheric eddies contribute to variations in concentration. Eddies larger than the (local) plume width cause the entire plume to waft back and forth without affecting its internal structure. This causes intermittency (periods of zero concentration at a given receptor position). Eddies about the same size as the plume mix clean air in and contaminated air out, causing plume growth, dilution and local distortions that contribute to in-plume fluctuations. The mean and fluctuating components of the concentration are calculated and combined with a probability distribution function to predict the fraction of time the threshold will be exceeded.

OMONOS takes a range of input data relating to the odour source, the odorous material being emitted, the atmospheric conditions and the receptor positions of interest, and determines the mean concentration at each receptor position. This mean concentration data is used as input to a probability model based on an enhanced version of Wilson's plume meandering model[6]. An estimate of the probability of exceeding the odour detection threshold is given based on four input parameters:

- *the concentration fluctuation intensity* [*i*] which is the ratio of the standard deviation of the instantaneous concentration to the time-averaged mean concentration (including zero concentration intervals) and is estimated from a meandering plume fluctuation model;

- *the conditional in-plume fluctuation intensity* [i_p] which is defined by the standard deviation and mean of the non-zero concentrations;
- *the intermittency factor* [γ] which is the fraction of time that non-zero concentrations occur in a time series and is calculated from an exact algebraic relation between i and ip;
- and a suitable *probability distribution* for non-zero concentrations (we use the log-normal distribution recommended by Wilson[6]).

Other parameters such as release height and source size have important effects and these are also accounted for in the model.

The results from the model compare well with published data on fluctuation intensities and intermittency and further validation studies are underway. Results depend significantly on the mean concentration model used and, for example, where mean concentrations from UK-ADMS[1] and the USEPA's ISC[3] models are different this will have a knock-on effect on OMONOS.

How Does OMONOS Work?

The software uses a set of Windows-based data entry screens to collect inputs for the model run.

For point sources, this includes information on the stack location, height and diameter, exit velocity and gas exit temperature. For area sources, size and location information is required. In all cases the emission rate is required and details of the name and threshold concentration for the odorous material being modelled. A list of odour detection concentrations obtained from the literature is supplied but the user can overwrite these data or input their own values. When inputting details for an odour source a diagram of the source locations is displayed on the screen to aid verification. This is particularly useful for verifying the coordinates when multiple point sources are input or when simulating complex area sources.

The model can be run for specific meteorological conditions where a wind speed at a known height is given and an atmospheric stability indicator is selected. The program uses the well-known Pasquill-Gifford stability classification scheme. There is also an option to run the model in *Screening Mode* where the user can opt to run centre line probability calculations for a range of predetermined wind speed and stability combinations. This mode returns results indicating the highest probability of odour detection and the corresponding wind speed and atmospheric stability. The combinations of values used are the same as those used in the USEPA SCREEN concentration model[4].

East/West and North/South receptor positions for each model run can be selected in one of three ways: by using a pre-defined array of positions, by specifying the minimum and maximum distances and the interval required, or by specifying precise locations.

All input data are validated against allowed ranges and for correct data type. Context sensitive help is available for most input fields taking the user to the relevant entry in the online help facility. Once all necessary input data have been supplied the model is run and the results can be displayed in a range of different formats. The input parameters used can be saved to a file for re-use at a later stage.

On screen, the results can be viewed in a table or as a text file which includes details of the input parameters used in the run. The option is available to save this text file to disk where it can subsequently be edited for use in reports or presentations.

A simple graphing routine allows the results to be viewed as line graphs. The user may elect to view the East/West probability profile at any given North/South offset, or to see the North/South profile at given East/West offset distance. Examples of these inputs and outputs are shown in Figures 2 to 5.

If the model has been run using sufficient receptor positions in both East/West and North/South directions, then the results may be viewed as a simple contour or three-dimensional surface representation as shown in Figure 3.

All of these on-screen displays can be printed directly from the program. The results generated can also be exported as standard comma separated values (CSV) files for post processing.

What Else Can OMONOS Do?

OMONOS offers the facility to run the model for *multiple isolated point sources*. Currently, data for up to ten discrete point sources can be input. At a given receptor position the total *mean concentration* of these sources is additive and determined by summing the individual mean concentrations originating from each point source. However, *probabilities* of exceeding the threshold concentration cannot be obtained by summing the contributions from individual sources (for example, it is possible that their sum would exceed the value of 1). Furthermore, addition does not address the situation where *instantaneous* concentrations for each point source lie below the threshold concentration but their sum exceeds the threshold level. Cheung[2] has developed a numerical method for combining probabilities from multiple point sources which incorporates the concentration fluctuation behaviour of each individual plume. An extensive literature survey for odour dispersion from multiple point sources would indicate that this model is the first of its kind.

The software can be used to model *area source* inputs. Wilson's fluctuation intensity model has been modified so that the probability of exceeding the threshold concentration no longer uses Gaussian mean concentration profiles but instead is a function of the variation of the mean concentration with crosswind distance from the plume centre line. Again it seems that OMONOS is the first practical model to deal with predicting the probability of exceeding the threshold concentration from an area source.

The software allows for circular and rectangular area sources and for the construction of more complex area sources which can be created using combinations of up to four discrete rectangular shapes (see Figure 5).

References

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3. ISCST3 (1995). *User's guide for the industrial complex (ISC3) dispersion models: Volume 11 - description of model algorithms.* US Environmental Protection Agency, North Carolina 27711, Report No. EPA-454/B-95-003b.
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5. Verschueren, K. (1996). *Handbook of environmental data on organic chemicals.* Van Noslvard Deinhold.
6. Wilson, D.J. (1995). *Concentration fluctuations and averaging time in vapor clouds.* Center for Chemical Process Safety of the American Institute of Chemical Engineers.
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Figure 1. Concentration fluctuations in a water channel simulation of plume from an elevated source, Wilson[6]. Time scale in seconds is approximately equivalent to minutes in full scale atmosphere.

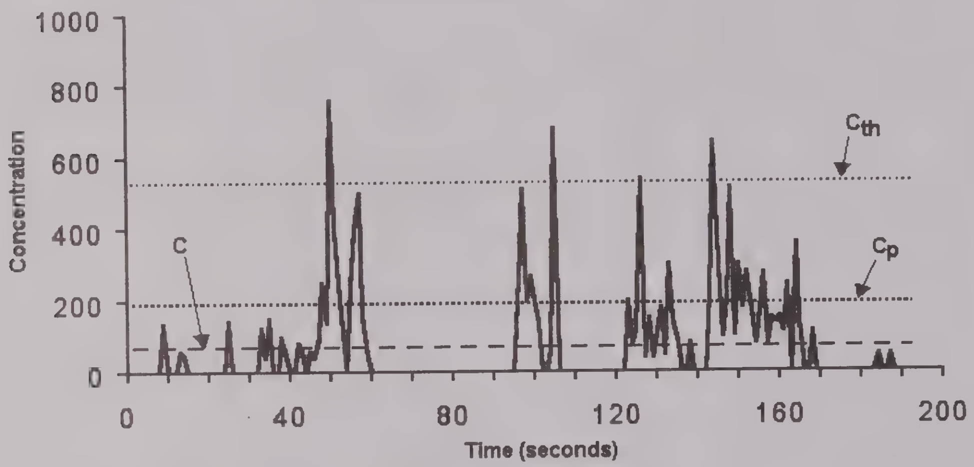
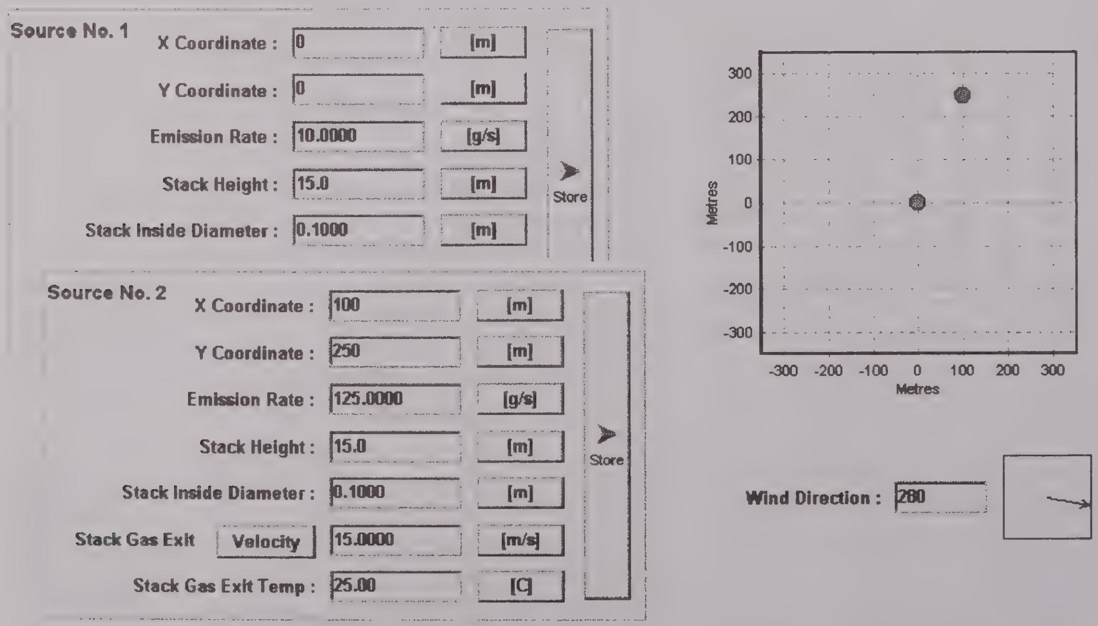


Figure 2. Multiple point source example input screens


Source No. 1
X Coordinate : 0 [m]
Y Coordinate : 0 [m]
Emission Rate : 10.0000 [g/s]
Stack Height : 15.0 [m]
Stack Inside Diameter : 0.1000 [m]

Source No. 2
X Coordinate : 100 [m]
Y Coordinate : 250 [m]
Emission Rate : 125.0000 [g/s]
Stack Height : 15.0 [m]
Stack Inside Diameter : 0.1000 [m]
Stack Gas Exit Velocity 15.0000 [m/s]
Stack Gas Exit Temp : 25.00 [C]

Wind Direction : 280

Figure 3. Multiple point source example North/South probability profile graph

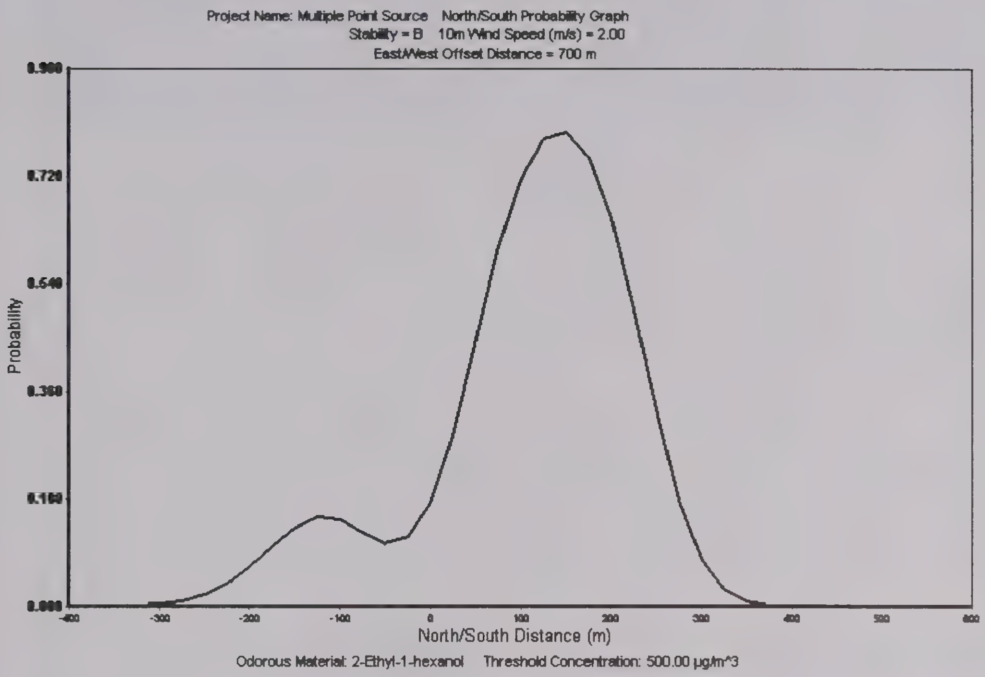


Figure 4. Multiple point source example contour and surface images

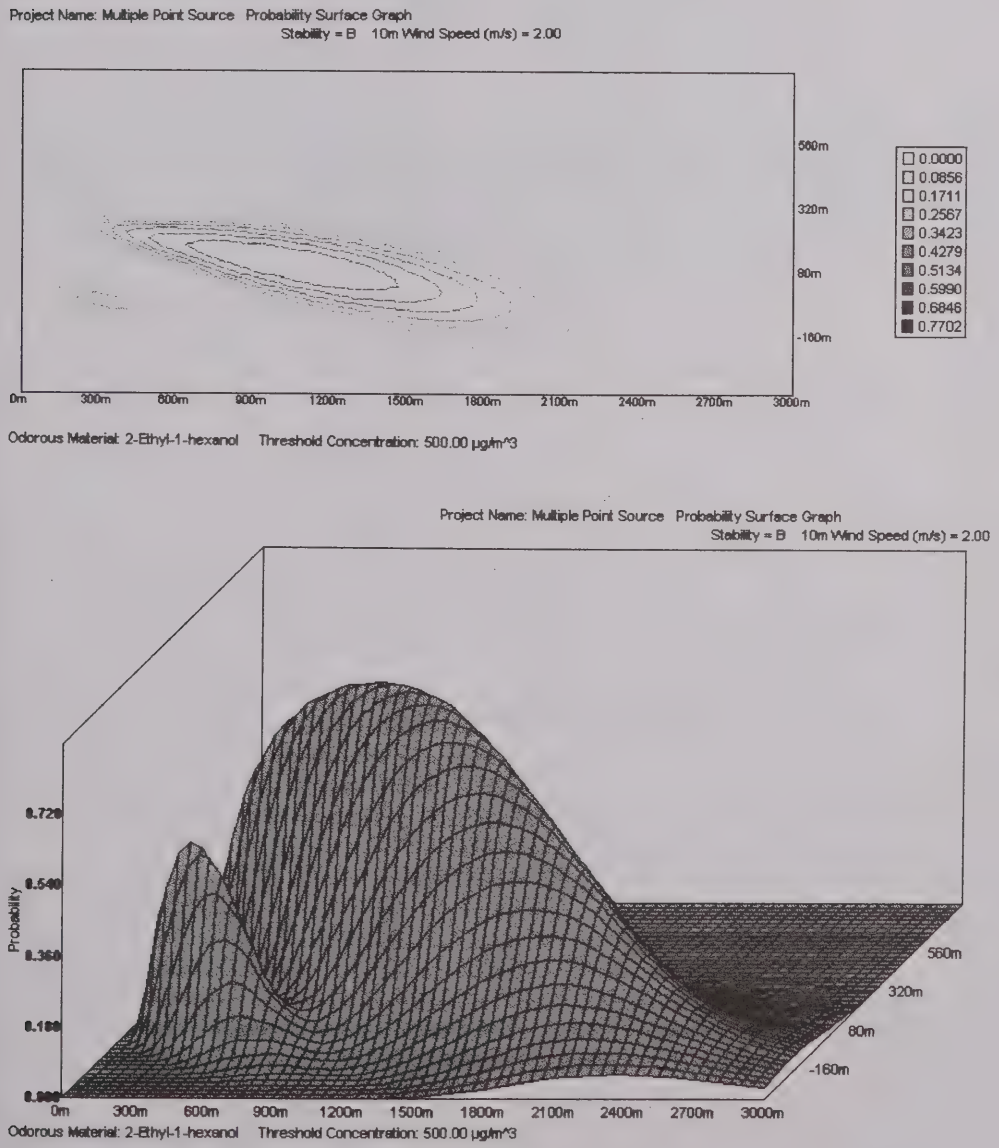
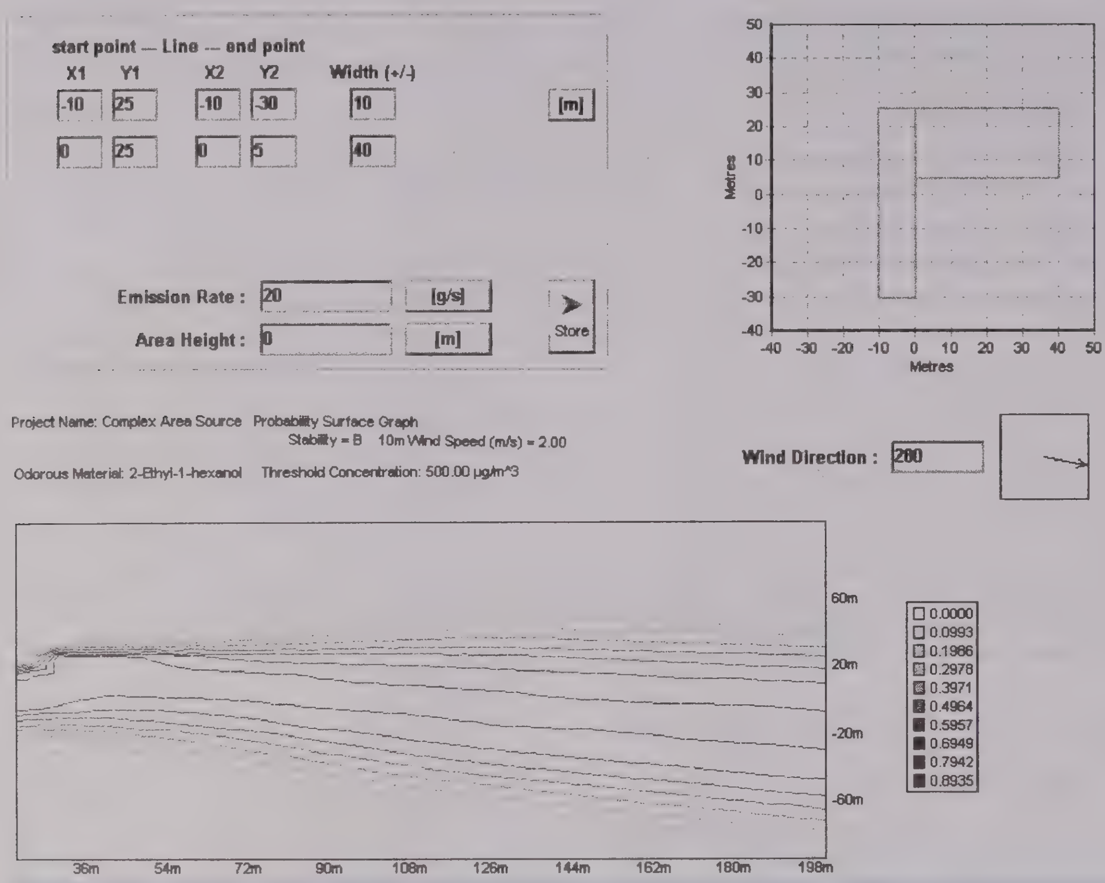


Figure 5. Complex area source example input screen and contour output



start point — Line — end point

X1	Y1	X2	Y2	Width (+/-)
-10	25	-10	-30	10
0	25	0	5	40

Emission Rate : 20 [g/s]

Area Height : 0 [m]

Wind Direction : 280

Project Name: Complex Area Source Probability Surface Graph
Stability = B 10m Wind Speed (m/s) = 2.00

Odorous Material: 2-Ethyl-1-hexanol Threshold Concentration: 500.00 µg/m^3

Further details about the software can be obtained by contacting Mr. John Stewart at The Department of Computer Science, The Queen's University of Belfast. BT 1NN. Tel: 01232 274619 or by e-mail to j.r.stewart@qub.ac.uk

Update

Waste Strategies

Draft waste strategies for Scotland and for England and Wales were published in May and June, respectively.

Scotland's draft strategy, which is produced by SEPA, sets out its policies and programmes for achieving the objectives of the EC's Framework Directive on Waste, the Environment Act 1995, and the recently adopted EC Directive on landfill; this latter requires the implementation of strategies to reduce the amount of biodegradable waste sent to landfill to be reduced to 75% of its 1995 total by 2006. To meet these responsibilities, SEPA will promote programmes aimed at ensuring all those involved in waste planning and management put in place the policies needed to achieve sustainable waste management, through:

- enforcement of waste regulation;
- facilitating strategic planning and the development of the necessary infrastructure for wastes at national and local level on the basis of best practicable environmental option (BPEO);
- setting targets for minimisation of waste production and for value recovery from waste and establishing systems to measure progress;
- encouraging the prevention or reduction of waste, the recovery of value from waste by recycling, re-use, reclamation and energy recovery, and the development of clean technology;
- establishing a strategy coordination group to encourage exchange of ideas, best practice and business experience to facilitate achievement of the strategy's objectives;
- working with other UK waste strategies to ensure the UK complies with its statutory EC responsibilities.

The draft strategy for England and Wales, *A Way with Waste*, notes that increased recycling and energy from waste will be vital if there is to be a reduction in the 27 million tonnes of household waste and the 70-100 million tonnes of industrial and commercial waste currently produced. The strategy notes that there will need to be changes in the way we think about and manage waste and resources if sustainable development is to be achieved; it sets goals of

- recovering 45% of municipal waste by 2010, through recycling, composting and incineration with energy/heat recovery;
- recycling or composting 30% of household waste by 2010.
- reducing total amount of industrial and commercial waste landfilled to 85% of 1998 levels by 2005.

The document looks at the steps needed to move towards a more sustainable waste management system and to meet the requirements of the recently adopted EC Directive on the landfilling of waste.

Home Composting Research

Although the Government is keen to promote home composting as a means of cutting the amount of waste sent to landfill, there has been little research into the *process* of home composting - most has focused on proving its efficacy. Now, results from a year-long project by the Centre for Alternative Technology (CAT) have shown that cardboard and paper can be combined successfully with garden and kitchen scraps to produce a fine High Fibre compost with good carbon/nitrogen ratio - the key to all good composting.

The aim of the project was to establish a blueprint for an easy and foolproof method of composting household waste, incorporating non-recyclable paper and card, with a minimum of instructions. After a year the study can claim a 72% success rate - good compost and lots of it; 81% of people involved in the project found the instructions easy to carry out and 70% claimed to have positively enjoyed the routine of making compost - a significant point if home composting is to be accepted into the domestic routine.

The next phase of the project will look at cultural aspects of home composting. The research team are looking into various possible interventions, including the development of a network of home-compost 'district nurses' supporting teams of 'compost paramedics' who will then assist home composters to enable community wide composting to take place on a larger scale.

CAT, which opened to the public in 1975, is now one of the oldest and best known environmental interpretation centres in Europe and has established a worldwide reputation as one of the leading organisations demonstrating ecological technologies and lifestyles.

For further information about CAT's composting project, contact Sarah Jenkinson or Nick Harrison on 01654 702 400; fax: 01654 702 782.

Support for Clean Vehicles

The Government has announced £3.3 million support for the Energy Saving Trust's "Powershift" programme which aims to develop a sustainable market for alternatively fuelled vehicles in the UK, giving air quality, noise and climate change benefits.

The Programme, which began in 1996, uses two approaches: pilot schemes which demonstrate electric, natural gas, and liquefied petroleum gas vehicles in operation; and grants towards the additional cost of purchasing alternative fuel vehicles. It has also produced the Powershift Register, which lists approved vehicles suppliers and converters to guarantee technical standards, safety and emission benefits. To date, Powershift has stimulated orders worth around £60 million for clean fuel vehicles and assisted in the purchase of over 1200.

ESA Chief Executive

The Environmental Services Association has appointed Mr. Dirk Hazell to succeed Peter Neill as Chief Executive. Mr. Hazell, who took up his position in July, is a barrister and graduate of the University of Cambridge and has worked in both the public and corporate sectors.

Environment Agency Chairman

Lord De Ramsay, Chairman of the EA since its inception in 1995, retires at the end of this year. His successor has yet to be announced.

New Chairman for SEPA

Ken Collins, a vice-president of NSCA and recently retired MEP for Strathclyde East is to succeed Professor William Turmeau as Chairman of SEPA. Mr. Collins, who was Chairman of the European Parliament's Committee on Environment Consumer Protection and Public Health, takes up his appointment in October.

Devolution

With effect from 1 July responsibility for environmental and pollution control legislation passed to the National Assembly for Wales and to the Scottish Parliament.

Transport Commission

The Commission for Integrated Transport was launched on 14 July. Chaired by Professor David Begg, the Commission is tasked with ensuring the Government delivers its integrated transport programme.

In its first year the Commission work programme will include:

- Examining local authority transport strategies to see how they meet integrated transport objectives, focus on best practice and advise on revised guidance to infuence the development of future plans;
- Assess the effectiveness of policy tools available to meet key integrated transport targets, such as the fuel duty escalator, and whether more targeted measures, such as road pricing, might replace it in the longer term;
- Examining potential quick wins on pollution, perhaps focusing on measures to be taken forward in collaboration with the Cleaner Vehicles Task Force. The Commission is to consider the retrofitting of older buses, lorries and taxis and a scrappage scheme to target older, more polluting cars.

In its second year the Commission plans to focus on public subsidy for the bus industry, rural transport, green transport plans, retail and leisure parking and longer term public expenditure priorities for integrated transport.

Members News

Members! Are we covering your news? Please check that your press office has *Clean Air* on its mailing list.

Ford is helping spearhead the world's first long-term testing programme for passenger cars powered by fuel cells. The P2000 fuel cell car is described as a direct hydrogen-fuelled, zero emission electric vehicle. Ford says that vehicles in the later phase of the programme will be fuelled by on-board reformers, producing hydrogen from methanol or petrol. Information on http://media.ford.com

Norwich City Council has launched a website giving information about local air quality on www.uea.ac.uk/env/aq/welcome.html

Tesco is to take advantage of the Vehicle Excise Duty rebate for cleaner vehicles by fitting **Eminox / Johnson Matthey** particle traps to 600 new and 400 existing trucks. The move will substantially reduce particle emissions from the Tesco distribution fleet, and save the company £1m a year in tax. Tesco says that the emissions from its lorries will be below those of a small passenger car. Information on 01992 646763.

Newham Council's Spotcheck initiative is pioneering a radical new way of co-ordinating environmental services, by targeting a specific area over a two-week period. During that time, a major uplift campaign will focus on the full range of Council responsibilities, including refuse collection, abandoned vehicles, parking enforcement, nuisance, development control and licencing. This will be followed by the introduction of a team of "streetwatchers" to make sure that improvements are maintained. Information on 0181 557 8759.

Croydon Council is introducing a 50-point green travel plan, promoting alternatives to car use and encouraging employees to reduce the number of journeys they make whilst delivering Council services and travelling to work. As the borough's biggest employer, the Council hopes to encourage other major employers to introduce similar plans. Information on 0181 760 5644.

An innovative energy-saving Millennium Centre and country park, established on reclaimed land in the middle of Dagenham, has won **Barking and Dagenham Council** the coveted London Spade Award. The centre is highly insulated, collects rainwater, and is powered by a wind turbine. Our photo shows Mayor Bill Dale receiving the award from Lord Birkett. Information on 0181 227 2107.

Divisional News

South East Division

The Divisional AGM elected Cllr F John Smith Chairman and Philip Thompson Deputy Chairman. Joe Beagle was re-elected as Honorary Secretary and George Vulkan Honorary Auditor. Prof Richard Scorer addressed the meeting on recent developments in climate change and global warming. The Division also made a visit to the Royal Botanical Gardens, Kew to observe the work being carried out on the conservation of endangered species.

As part of the Centenary Celebrations the Corporation of London has kindly given permission for the South East Division to hold a buffet reception at the Guildhall, and to display an exhibition at the Guildhall from September 13-17.

The East Midlands Division Centenary lunch was addressed by Environment Minister Alan Meale, who spoke about the contribution NSCA has made to environmental protection. The Minister promised to work with the Society in developing a national noise strategy. He also presented a Certificate of Commendation and a set of engraved glasses to Cllr Michael Caufield of Chesterfield Borough Council. Mr Meale is shown below with Cllr Caufield and Divisional Chairman Dr Mary Newlands.

Future Events

8-10 SEPTEMBER - International Symposium on Non-CO_2 Greenhouse Gases

This second international symposium of the European Federation of Clean Air and Environmental Protection Associations aims to improve scientific understanding, control and implementation measures, focussing on methane, nitrous oxide and fluorine compounds. The symposium is sponsored by IPCC, EU, UN-FAO, IGBP, Eurotrac-2, The Netherlands Ministry of Environment and USEPA. Reduced registration fee for NSCA members.

Venue: Congress Centre, Noordwijkerhout, The Netherlands.

Details: VVM-CLAN; Fax: +31 73 621 6985; Email: vvm@wxs.nl; Website: http://milieuonline.nl.vvm

11-14 OCTOBER - International Conference on Atmospheric Dispersion Modelling

6th International Conference on harmonisation within atmospheric dispersion modelling for regulatory purposes; aimed at model developers and model users, and environmental agencies. Abstracts required by 20 February.

Venue: Rouen, France.

Details: Prof. Alexis Coppalle, CNRS - Université & INSA de Rouen; Fax: +33 2 32 95 97 80; Email: Alexis.Coppalle@coria.fr; Website: http://www.coria.fr

25-28 OCTOBER - NSCA Annual Conference and Regional Conference of IUAPPA

NSCA's Centenary celebrations will culminate in Environmental Protection 99 Conference and Exhibition, with a programme reflecting the fact that it is also the occasion for a Regional Conference of the International Union of Air Pollution Prevention and Environmental Protection Associations.

Venue: Brighton, UK.

Details: NSCA; Fax: 01273 735802; Email: admin@nsca.org.uk

1-12 NOVEMBER - Sustainability 2000

Free online global convention and learning zone for sustainable development. The website includes an online convention hall, discussion areas, a research centre, multimedia games park, global search facility and a centre of excellence.

Venue: www.sustainability2000.org

Details: Delyth Forsdyke, Institute of Chemical Engineers. Email: dforsdyke@icheme.org.uk

FORTHCOMING NSCA EVENTS

Tuesday 14 September
Training Seminar - NEC Birmingham
Noise Update 1999

Monday 25 to Thursday 28 October
Annual Conference and Exhibition - Brighton
Environmental Protection 99
13th IUAPPA Regional Conference

Wednesday 10 November
Training Seminar - NEC Birmingham
Air Quality Management Update

Thursday 25 November
Workshop - London
UK Dispersion Model Users Group

Tuesday 15 February 2000
Training Seminar - NEC Birmingham

Thursday 6 and Friday 7 April 2000
Spring Workshop
Staverton, Northamptonshire

Monday 23 to Thursday 26 October
Annual Conference and Exhibition - Scarborough
Environmental Protection 2000

For further details please contact
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136 North Street - Brighton BN1 1RG
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A Selection of Recent NSCA Publications

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Reducing the Environmental Impact of Vehicles in Urban Areas

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Transport & Travel Research Ltd and
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A 4 page summary is available on receipt of an A4 envelope with 19p postage.

Full Report, A4, 116 pages, ISBN 0 903474 47 6 - £25.00

Transport Emissions Assessment

Teachers' Notes and Pupil Activity Booklet

The main aim of the booklet is to raise pupil (and public) awareness of the impacts their transport choices can have on the environment, and to demonstrate the difference they can make collectively and as individuals.

A4, 20 pages, £4.00, 10 or more 25% discount

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by Dr R L Maynard, Department of Health

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A4, 36 pages, ISBN 0 903474 46 8 , £15.00

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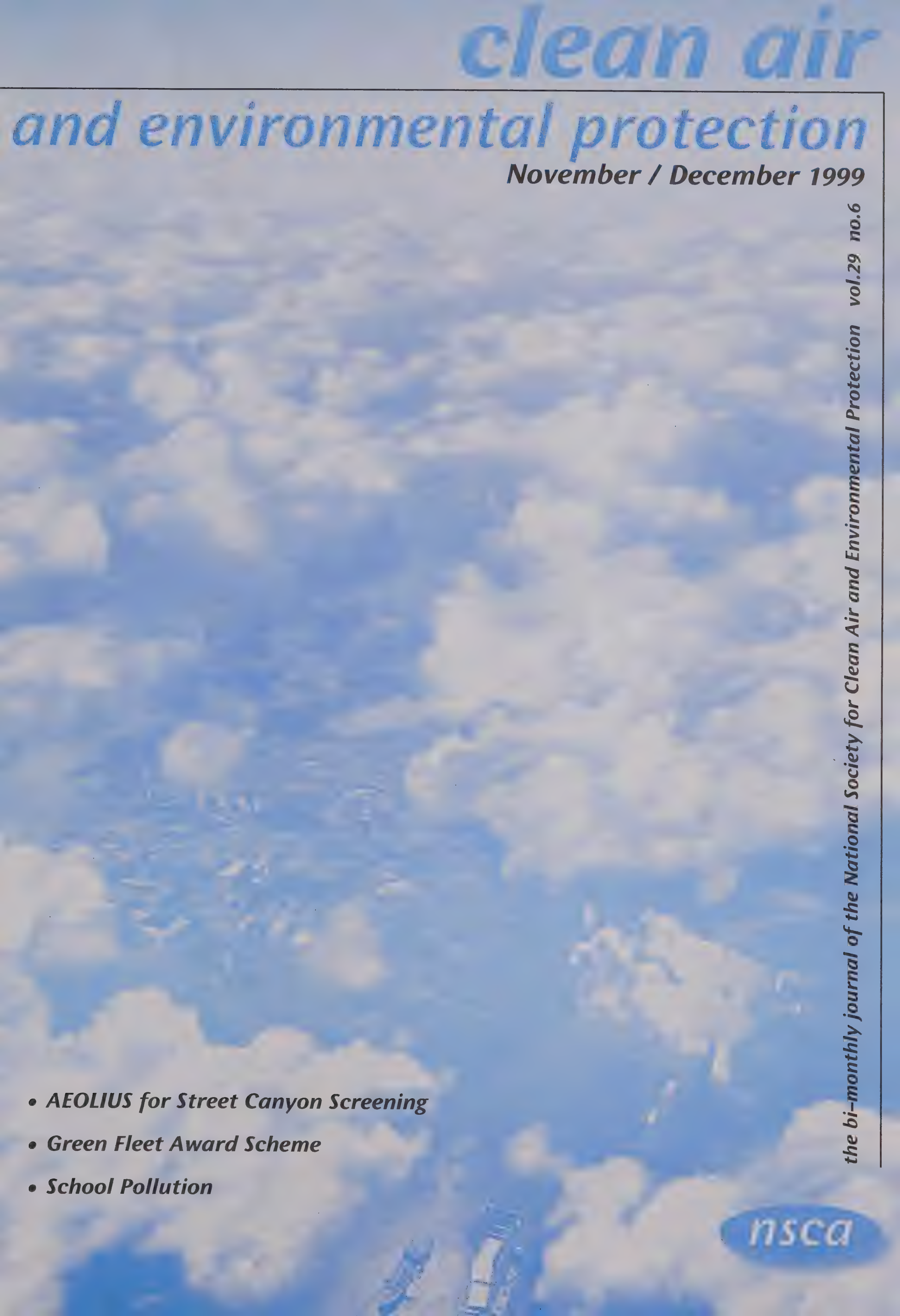

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- *Green Fleet Award Scheme*
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The National Society for Clean Air and Environmental Protection produces information, organises conferences and training events, and campaigns on air pollution, noise and environmental protection issues. Founded in 1899, the Society's work on smoke control led to the Clean Air Acts. More recently NSCA has been influential in developing thinking on integrated pollution control, noise legislation, and air quality management.

NSCA's membership is largely made up of organisations with a direct involvement in environmental protection: industry, local authorities, universities and colleges, professional institutions, environmental consultancies and regulatory agencies. Individual membership is also available to environmental specialists within industry, local authorities, central government, technical, academic and institutional bodies.

Members benefit from joining a unique network of individuals who share an interest in a realistic approach to environmental protection policy; from access to up-to-date and relevant information; from reduced fees at NSCA conferences and training events. They contribute to NSCA's regional and national activities; to environmental policy development; to translating policy into practice; to the Society's wide-ranging educational programmes.

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Editorial

A Decision for Members

While the NSCA has changed its name a number of times over the last century, it retains its traditional character as a corporate society governed by its members, and with membership open to anyone, either individual or corporate body, ready to subscribe to its objectives. This distinguishes it both from the narrower professional institutes that have emerged in the environmental field over the last century, and from the campaigning groups, whether in the form of single-issue pressure groups or of broad-based mass organisations.

While elected officers and professional staff may have a duty to lead the organisation, our corporate form places a particular responsibility on the membership, corporate and individual, to make their views known on issues of importance to the Society. The name of the Society is one such issue.

The arguments have been clear for some time. The Society's name must properly reflect its role and the range of its work. With the steady widening of the Society's interests, into noise, local environmental management and land contamination, it is clear that many members doubt the present title adequately secures that. At the same time, it is important to avoid any impression that the Society is in any way diminishing its interest in air quality or its commitment to its role as the UK's leading non-governmental body on air pollution issues.

That means striking a careful balance, and as discussion continues through the next couple of months, the Council and Trustees will have several aims. Any change must reflect as far as possible a broad and settled consensus within the Society, and in keeping with the Society's approach to issues must reflect rational and open debate. It is also important that the choice reflect not only current circumstances but also the changes which the next ten or twenty years may bring. If a change is agreed it must be implemented over such a period and in such a manner as best secures the continuity and effectiveness of the Society's work.

This choice is, above all, one for the full membership. The officers and staff greatly appreciate the time members are taking to make their views known.

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Air Quality Management - Update

The latest in a series of NSCA seminars designed to update local air quality specialists on policy developments. This seminar will focus on progress with the Air Quality Strategy, The Review and Assessment process, and policy measures for Local Air Quality Strategies and Action Plans.

Wednesday 10 November 1999
National Exhibition Centre, Birmingam
For a copy of the brochure
contact NSCA on 01273 326313 or EMail: klennon@nsca.org.uk

NSCA UK DMUG 10th Meeting

Techniques for Dispersion Modelling and Development of Good Practices

Thursday 25 November 1999
Chadwick House - London SE1

This meeting will be focusing on the use of wind tunnels and a comparison of the performance with numerical models.

The broad aims of the UK DMUG are to

- *improve the performance of available air dispersion models by influencing model development, in accordance with the needs of the modelling community and*
- *foster the improvement of dispersion modelling techniques through improvements in communications and dissemination of knowledge within the user community.*

For further information and a brochure please contact NSCA
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NSCA News

Policy Committee Update

With the arrival of autumn and the New Year just a few months away, NSCA's policy committees have been getting back into action after the holiday season. Policy Officer, Tim Williamson, gives an outline of their current activities and future priorities.

NSCA has three main policy groups, Air Quality, Noise and the Local Environment Management Forum, which meet between four and five time per year and all report directly to the Council of the Society. The committees are made up from active and expert members, invited experts from outside NSCA and representatives nominated by Divisional Councils. They provide possibly unique fora for industry, local authorities and environmentalists to discuss, and form a consensus on, the current issues of concern for their particular subject area.

Air Quality Committee

Chaired by Prof. Bernard Fisher from Greenwich University, this Committee's main focus is the delivery of effective air quality management both at a local and national level. Their main concern this year has been the review and subsequent revision proposals for the National Air Quality Strategy. The Committee developed the detailed NSCA response to the first review of the Strategy, which opposed the relaxation of the objective for PM_{10} and pushed for a greater emphasis on measures to deliver the objectives, and is currently working on a response to the new Draft Strategy. (See Update section of this issue of *Clean Air* for a summary of the proposed revisions to the Strategy.)

On a more practical level, the Committee has formed a working group to investigate the procedures for declaring Air Quality Management Areas, including the treatment of modelling data and uncertainties. This group will be reporting at the end of 1999 and should provide some real assistance to air quality managers going through the process of declaring an AQMA. The Committee has already been active in the provision of practical advice on LAQM through its work on the NSCA document *Consultation for LAQM: The How To Guide*, which was issued free to all local authorities. Copies of the guide are available from the NSCA head office.

Noise

The NSCA National Noise Committee, under the chairmanship of Brian Marsh, remains one of the very few fora where noise practitioners, policy makers and researchers can meet to discuss noise control and the best ways to take this forward. The Committee is responsible for co-ordinating National Noise Action Day which, with the support of DETR, was greatly expanded this year. The main focus for the Committee is, however, the campaign for a National Noise Strategy, to provide a coherent policy framework for noise control in the UK. The Committee is currently working with other organisations, including DETR, to define what such a Strategy should encompass and how the complexities of the noise problem can best be dealt with.

Education at an early age is seen as a major contributor to the long term success of any noise policy. The Noise Committee is overseeing the production of a Noise teaching resource, aimed at Key Stages 3 and 4 (secondary schools). The pack will be ready in May 2000 and it is hoped that a pack for younger age ranges can then be produced. Other recently completed work includes the development of a guide for drafting Codes of Practice on Noise under the *Control of Pollution Act 1974*. The guide has been submitted for approval by DETR and is currently being assessed.

Local Environment Management Forum

The Forum, currently chaired by Derek Osborn CB, is mainly concerned with the application of sustainable development at the local level. It is undertaking three main projects, the first of which is the campaign for the early introduction of a duty on local authorities to promote sustainable development. A commitment to legislate for this, through a duty to promote the social, economic and environmental well being of an area, has already been given by the Government, in the Modern Local Government White Paper, and subsequently by Ministers. NSCA has joined forces with the LGA and others to press the Government to fulfill this commitment.

The Forum has actively contributed to the report of the Urban Task Force, Towards an Urban Renaissance, and is in the process of preparing submissions for the forthcoming urban and rural White Papers. These processes of urban renewal and the relationship between urban centres and rural areas is seen as crucial to the furtherance of local environmental management. The Forum is seeking to keep local authorities at the heart of these processes and to ensure that innovation and flexibility are rewarded.

In line with this, the Forum is co-ordinating the NSCA Innovation in Sustainable Development Awards for local authorities. The awards are in their first year and the interest shown by local authorities, with over sixty entrants, has been very gratifying. The winners will be announced at this year's NSCA Annual Conference in Brighton, at the end of October.

NSCA IT Overhaul

Head office in Brighton has recently undergone an overhaul of its IT systems, in time for the new millennium. We now operate on a networked system (Windows NT 4.0 for those in the know) which allows greater access to documents and the potential for more integrated working. Our Internet Service Provider is also new and while most of the email addresses remain the same, some new ones have been added:

Tim Brown, Deputy Secretary, Policy and Development:	tbrown@nsca.org.uk
Tim Williamson, Policy Officer and Commissioning Editor, Clean Air:	twilliamson@nsca.org.uk
Mary Stevens, Projects Manager:	mstevens@nsca.org.uk
Loveday Murley, Editor and IUAPPA Co-ordinator:	lmurley@nsca.org.uk
Peter Mitchell, Deputy Secretary, Administration and Finance:	pmitchell@nsca.org.uk
Sally May, Administration - Policy Support:	smay@nsca.org.uk
Wendy Ashton, Secretary to Richard Mills and Committee Secretary:	washton@nsca.org.uk
Katherine Lennon, Administration - Finance:	klennon@nsca.org.uk
General enquiries:	admin@nsca.org.uk
Information requests:	info@nsca.org.uk
IUAPPA:	iuappa@nsca.org.uk

email for Richard Mills, Secretary General, should be sent to Wendy Ashton.

The NSCA website is also being moved and will be at http://www.greenchannel.com/nsca. Please accept our apologies for any inconvenience during the transition period.

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Reports

DEVELOPMENT OF AEOLIUS FOR STREET CANYON SCREENING

D.R. Middleton

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The AEOLIUS nomogram and computer programs were developed for the task of screening air pollution in congested urban streets. They are designed for ease of use. They require few numbers to be input. We describe how AEOLIUS came into being, and compare it with the Design Manual method.

1. Introduction

The work began with the aim of improving the daily forecasts of air quality. A computer program was coded following the work of Dr Ruwim Berkowicz, and validated with measurements from Birmingham City Council and Cromwell Rd in London. Trial forecasts were initiated. With the Environment Bill before Parliament, a need arose to have a simple means of assessing air quality due to motor vehicles in street canyons. The code was used to develop a simple paper nomogram. We describe how the complex problem of pollutant dispersion in the flow between buildings combined with traffic induced turbulence might be simplified for screening. On the hypothesis that two worst cases exist, namely in parallel and in perpendicular lee flow, the Nomogram was developed. This in turn led to a computer version of the screening approach. A field experiment was conducted in Leek, Staffordshire to validate the method and to study the roof top wind that is crucial to the model calculations. The paper ends by comparing the Nomogram with DMRB. There is now a series of programs in the AEOLIUS suite that are available on the world wide web. They are designed for use by local authorities in the reviews and assessments of air quality. A primary motivation for the work was to support the implementation of Part IV of the Environment Act 1995. In dispersion modelling, there is always a great simplification of complex processes, and the validation results show by their scatter that users of the AEOLIUS suite should take due note of the uncertainties inherent in the work.

2. History of AEOLIUS

The work to be described took place at intervals over a period of five years, and a brief chronology summarises the development of a practical system for assessing the likely air pollution in narrow streets with buildings on either side. Figure 1 shows an idealised canyon circulation.

- *18-30 March 1994* - Dr Ruwim Berkowicz presented results using the OSPM model to describe air pollution from traffic in Copenhagen, Denmark. Berkowicz et al. (1994) gave two striking plots (their Figures 3, 4, ibid) whereby similar modelled and measured concentrations in the canyon showed a curious dependence upon wind direction. Their graphs present the results normalised by emissions strength, with background concentrations outside the street canyon being subtracted.

At this time, daily air quality forecasts using the box model known as BOXURB (Middleton, 1998) paid no attention to local effects. The pollution concentrations might be higher at sites such as the Cromwell Road, where there was traffic and nearby buildings. There was a clear need to have a model for such local effects. Reports and papers sent by Dr Berkowicz were used by Adrian Buckland to develop a computer code that could make street canyon calculations. His code ran successfully to 4 July 1994. He gathered validation data from London and Birmingham.

- *14 December 1995* - The first trial forecast of air quality local to the Cromwell Rd was generated in the Met Office using the canyon code within BOXURB. It calculated NO_x, then used the empirical ratio from Derwent and Middleton (1996) to estimate NO_2. It also generated PM_{10} forecasts using an empirical correlation between PM_{10} ($\mu g\ m^{-3}$) and NO_x (ppb) which was developed by Helen Johnson (1995), a student working with us:

$$PM_{10} = m \times NO_x + c$$

where the empirical values from regression on AUN hourly average concentrations were $m = 0.35$ ($\mu g\ m^{-3}\ ppb^{-1}$) and $c=10.0$ ($\mu g\ m^{-3}$). This equation may reflect primary particulate contributions dominated by vehicle emissions near the monitoring sites. Peaks from secondary particulate are thereby missed. These forecasts of local PM_{10} could not be used operationally however, since they ignored daily changes in secondary particulate which would be imported with the prevailing winds.

- *5 March 1996* - A meeting at the Met Office reviewed the interpretation of air quality data. Mr Frank Price, on hearing about the canyon work, asked if a simple method could be devised, something like the DMRB method, that would give local authorities an objective tool to see which streets might be most polluted. This would help for instance in the economic deployment of pollution monitors. Work commenced to meet this challenge; the model was run through many different test cases until the key ideas for the nomogram had been formulated as in Figure 2, which illustrates the method of Buckland and Middleton (1999), as described below.

- *12 April 1996* - Mr Simon Rafferty phoned the Met Office to consult the dispersion modelling help line (which had just been started). He sought clarification on the relative possible contributions of the motorway, the potteries, and local traffic, on air quality in Leek, Staffs. This seemed an ideal test case for our new nomogram.

- *13-14 May 1996 & 24-25 June 1996* - The author and Adrian Buckland visited Leek, to demonstrate the draft Nomogram (Buckland and Middleton, 1999). Simon Rafferty suggested that a computer version would be a good idea. By then our work with the nomogram had reduced the problem to two worst cases, parallel and leeward, so a screening program only had to model two wind directions.

- *6 July 1996* - A screening program AEOLIUS Screen had been developed. It asked the user a minimum number of questions. The program included NO_2 estimates from NO_x via the empirical ratio cited above. It also employed surrogate statistics from DMRB (1994). It had built in emissions, with no option for the user to alter them.

- *11-12 July 1996* - Adrian Buckland (1999) presented his validation of the street canyon code using data from Stratford Road Birmingham and Cromwell Road London. The correlation between the model and the measurements was very variable, and there was uncertainty regarding the influence of side streets. It was necessary to add background concentrations, as air entering the canyon carried with it pollutants from other sources in the city. The background varied with prevailing conditions, time and date.

- *28 August 1996* - The paper summarising the validations was completed, Buckland (1999). He found that the available data were insufficient to fully understand the factors influencing the performance of the model. Field experiments were advisable.

- *12 & 23 December 1996* - Adrian Beeching of Cambridge City Council said a version to employ hourly meteorology and traffic flows would be useful for the First Phase trials funded by DoE (now DETR). Dr Alistair Manning assisted in developing AEOLIUSF Full. It accepts any wind speed and direction and calculates hourly concentrations month by month. It uses files with a one week summary of the traffic data, as this might be all that a local authority has from a traffic census. The model uses hourly meteorological data (wind speed, direction, temperature, pressure). The current version of AEOLIUSF Full was finalised on 5 March 1997.

- *24-25 March 1997 until 17 December 1997* - Instruments operated in Leek, Staffs to measure winds above the roof, next to a street canyon and near to the existing monitors for traffic counts and CO concentrations. Figure 3 shows the lightweight propellor anemometers on the mast mounted on a flat roof. A data logger took 15 minute averages; the lower measuring point was lowered during the study to test for flow interferences caused by buildings. This was a joint experiment by Staffordshire Moorlands District Council and the Met Office.

- *30 May 1998* - The paper on the Leek experiment by Manning et al. (1999) was submitted for publication. It discussed the effects of the buildings on the roof top wind, comparing modelled with measured concentrations, and examined the effect of using either a distant airport wind or a local roof top wind. The latter, being slower, gave slightly higher modelled concentrations than if the airport wind was used.

- *17 February 1999* - AEOLIUSQ Emission was finalised. It allows the user to choose emissions, perhaps from DMRB (1999) or the National inventories. The surrogate statistics were removed, as these changed with the revision of DMRB. The empirical estimate for NO_2 remained. AEOLIUSQ Emission replaces AEOLIUS Screen.

- *19 May 1999* - DMRB (1994), DMRB (1999), AEOLIUS Nomogram, and AEOLIUSQ Emission were compared as below (Section 5). It appears that the relative magnitudes of the concentrations yielded by these methods can now be explained. The background multiplier in DMRB (1994) seems the likeliest explanation for why an open road in DMRB (1994) apparently gave bigger values than the canyon model. Values in DMRB (1999) are now smaller than in the 1994 version, with the removal of the background multiplier.

3. AEOLIUS Nomogram

This nomogram for pollution from traffic in street canyons is available as a paper by Buckland and Middleton (1999). It was made from a series of simulations using the full AEOLIUS model. The method gives results similar to AEOLIUS Screen. In congested street canyons, it seems likely that emission factors for low traffic speeds will be the most relevant. Emissions from stop-start traffic are difficult to estimate. Many factors such as queuing times and queue length are involved. Street widths are to the building facades so include footpaths, and building height is easily obtained using an inclinometer.

1. Measure street geometry and estimate traffic flows and speeds.

2. Estimate emission factors for typical vehicle in g/km. DMRB (1999) can be used, or the UK National Emissions Inventory.

3. Using the paper Buckland and Middleton (1999) look up the concentrations for parallel and perpendicular flow; use the unit source strength concentration C_1 according to wind speed and pollutant i.e. Table 3 from Table 2e (ibid).

4. Similarly, as in their paper, look up the correction factors F_9, F_{10}, F_{11}, F_{12} from Figure 2, i.e. Figures 9-12 (ibid).

5. Multiply factors and concentrations together.

6. Add background C_0.

The screening nomogram gives a value of the concentration C (parallel or leeward)

$$C = q_s \times C_1 \times F_9 \times F_{10} \times F_{11} \times F_{12} + C_0$$

The method is illustrated below (section 5).

4. AEOLIUS Suite of Models

This refers to a suite of computer models descended from code by Buckland (1998) who cites earlier references, drawing on research by Berkowicz et al. (1994). Related work on the nomogram (above) and field validation appears in Buckland and Middleton (1999) and Manning et al. (1999) respectively. The latter paper (ibid) also discusses the merits of wind speed data from outside the town, or at roof level. Manning et al. (1999) found that roof top winds in a town (Leek, Staffs) were smaller than the well exposed 10 m anemometer reading at a distant airport (Manchester). The Leek roof wind was about 60-70% of that recorded at Manchester, some 40 km away.

4.1 AEOLIUS Screen

The Screen code was derived by Mr Buckland with the benefit of experience in simplifying the problem into paper nomogram form (Buckland and Middleton, 1999). It is based on the full program, but made as easy and quick to run on a PC as possible. The ***Screen*** version cannot model changes in wind direction, whilst the ***Full*** version can. The Screen version is ideal for the rapid comparison of a number of different street canyons to see which is likely to be the most polluted street within a town. This model was built for local authority use. It is on the internet as described in Section 6. AEOLIUSQ (below) is now preferred for screening work.

4.2 AEOLIUSQ Emission

The original screening version AEOLIUS Screen has been extended by the author to allow the user to input their own emission factors (g km^{-1}). It is called AEOLIUSQ. It can be used with emission factors from DMRB (1999). AEOLIUSQ assumes all vehicles have the same average emission factor q. The emission factor must represent the local mix of vehicle types and take account of vehicle speed. AEOLIUSQ has the option of a roof top wind, although for normal use wind data from a well exposed anemometor at 10 m can be used. AEOLIUSQ does not apply any site to site differences in scaling the wind from 10 m to roof height. AEOLIUSQ is designed for screening purposes by local authorities, e.g. Stage Two Assessments in street canyons. The fleet averaged emission factor q g km^{-1} per typical vehicle at some chosen vehicle speed is calculated from

$$q = \sum_{i=1}^{n} f_i q_i$$

where there are n types of vehicle e.g. light and heavy, n = 2; or car, bus, motorcycle, taxi, lgv, hgv, n = 6. Each vehicle type i has an emission factor q_i. The emission factors must be chosen for the year being modelled (to allow for changing emissions control technology) and at the chosen vehicle speed (which has a marked influence on emissions). The fleet composition is described by the fractions f_i of each vehicle type i in the total fleet; hence $\sum f_i = 1$. Then q is input to AEOLIUSQ.

4.3 AEOLIUSF Full

The ***Full*** code by Buckland (1998) was developed for air quality forecasts. It calculates hourly concentrations of pollutant from motor vehicles in street canyons. Field validation appears in Manning et al. (1999). The program asks the user to give the name of a Datafile which contains important run time information like emission factors for small vehicles and for large vehicles, the orientation of the canyon, and choice of pollutant. The file also tells the program the names of four other input files needed for the run, which are:

1. Traffic flows (small vehicles per hour arranged as typical count to each hour ending for each day of the typical week);
2. Traffic flows (large vehicles per hour arranged as typical count to each hour ending for each day of the typical week);
3. Traffic speed (miles per hour during each hour for each day of the week);
4. Meteorological data file (hourly values of wind speed, direction, temperature and pressure for every hour in the period of interest).

AEOLIUSF may be useful in Stage Two and Stage Three Assessments. It can be used to derive percentiles or annual mean concentrations, using the three typical weekly traffic files, along with twelve monthly files of hourly meteorological data.

4.4 AEOLIUSH Hour

AEOLIUSH Hour is a research version with an input file holding hourly data for both traffic and meteorology, with optional anemometer height. AEOLIUSH is useful for analysing field data; it allows constants in the equations to be varied. Traffic flows and meteorology are required for every hour of the study period (hence the acronym AEOLIUSH Hour), unlike AEOLIUSF Full which expects a 1 week summary of light and heavy vehicle hourly flows.

5. Comparison of Screening Methods: Canyon and Road

It is interesting to see how the methods compare in magnitude, given similar emission rates. We might suppose that a canyon has higher air pollution than an open road, all factors other than geometry being the same. This hypothesis will now be examined. Since vehicle speeds affect pollutant concentrations, this must be taken into account.

5.1 Response to Vehicle Speed via the DMRB (1999) Emissions

The Design Manual for Roads and Bridges DMRB (1999) was revised by TRL to match the requirements of the UK National Air Quality Strategy. The most important changes were to use annual mean traffic flows, to provide surrogate statistics which start from annual mean concentration and lead directly to estimates of air pollutant quantities in the form required by the Strategy Objectives, and to remove the background factor from the pollutant dispersion curve. Minor changes included some adjustments to the emission factors. With DMRB (1999), reduced vehicle speed only operates via the associated change in emission factor; there being no explicit allowance for any wake variation effect.

In Tables 1, 2 we give results for CO and NO_x obtained from the model, AEOLIUSQ. The emission factors for light vehicles travelling at speed 100 km/h and base year 1996 have been taken from DMRB (1999). We also ran the calculations at decreasing traffic speeds, down to 5 km/h. Tables 1, 2 show how reducing the vehicle speed is accompanied by emissions (from DMRB, 1999) that first decrease, then rise again at the lower speeds. At the same time, AEOLIUSQ responds to the decreasing speed by gradually reducing the vehicle wake turbulence, which on its own (constant q) causes a gradual increase in calculated concentration at lower vehicle speed: cf Factor 9 (Figure 2), after Figures 5, 9 in Buckland and Middleton, (1999). Tables 1, 2 show the combined effects in AEOLIUSQ of both the increased emission factor and the decreased wake turbulence as the speed is reduced to 5 km/h. Owing to both effects combining with restricted dispersion, congested street canyons are likely to figure strongly in the debate about potential pollution 'hot-spots'.

5.2 Comparing AEOLIUSQ with DMRB (1994 and 1999)

AEOLIUSQ and DMRB (1999) were compared as follows. Consider the base case with 1000 light vehicles per hour, at speed 100 km/h, using emissions year 1996. The base case emission rates were 4.98 g/km for CO and 1.80 g/km for NO_x (DMRB, 1999). From Tables 1, 2 with these emissions, the canyon concentrations from AEOLIUSQ were 0.38 and 0.39 ppm CO, or 84 and 86 ppb NO_x, for leeward and parallel respectively. The roadside concentrations at 5 m from the road in DMRB (1999) are 0.254 ppm CO, and 55.9 ppb NO_x.

The earlier DMRB (1994) had used a different base year of 1995, with the same 1000 light vehicles per hour, at speed 100 km/h. These base case emission rates for 1995 were 3.62 g/km for CO and 2.45 g/km for NO_x. In addition to the emissions change, there is also a major change due to the background multiplier present in the 1994 version but removed from the 1999 version (this was discussed in Section 2.2.3, paragraphs 5-7). The roadside concentrations at 5 m from the road in Figure 2 of DMRB (1994) were 0.505 ppm CO, and 200.4 ppb NO_x. To compensate for the change in base emissions, we can multiply the concentrations from DMRB (1994) by 1.376 (CO) or 0.735 (NO_x) to get 0.695 ppm CO and 147.2 ppb NO_x. These results are then in terms of the same emissions which are in DMRB (1999) as above. They are however much larger because they contain the multiplier for the background.

Given similar emissions, and in the absence of any background contributions, the canyon model AEOLIUSQ gave higher concentrations than the proposed DMRB (1999) beside an open road. Furthermore, for a given emission factor, the slower the vehicle speed, owing to the reducing wake dilution, the more AEOLIUSQ is likely to exceed DMRB (1999). Finally, we note that whilst the old version DMRB (1994) is no longer current, it gave values greater than AEOLIUSQ because of its background multiplier.

5.3 Averaging Time

The above comparison assumes that averaging time does not feature significantly in the dispersion curve in DMRB (1999). The role of averaging time was discussed by Middleton (1999), Section 2.2.3, paragraph 5. In the present study, since the DMRB (1999) averaging time for the pollutant concentration dispersion curve is effectively that of the traffic data, and because we have assumed an hourly average traffic flow of 1000 vehicles per hour, the above concentrations using DMRB (1999) are effectively 1 hour values. This is why the present author assumed that they can be compared with the AEOLIUSQ results.

However the method that is recommended in DMRB (1999) is to adopt annual average traffic, and to estimate annual average pollutant concentrations accordingly. Also, our comparison here was to get a feel for whether AEOLIUSQ is likely to give a greater or smaller value than DMRB (1999), since intuitively we might suppose the canyon case to be the more polluted, other factors being the same. When seeking an annual mean concentration in a canyon, it is probably better to use AEOLIUSF Full with files of meteorological data, and allow for changes in wind speed and direction during the year. To test this assumption on annual means of measured data needs a canyon with hourly data for traffic, local meteorology, and pollutants, all to be monitored for a full year.

5.4 Using the AEOLIUS Nomogram

The same problem may be analysed without a computer by using the AEOLIUS Nomogram from Buckland and Middleton (1999). The method is simple to follow; see the paper for full details and justification of this approach. Concentrations were calculated by an early version of the AEOLIUS model. Examples of their results for CO and NO_x, using a unit source emission factor of 1.0 g/km per vehicle, are given below, Table 3 (from Table 2e, ibid). The values represent a standard case; the Nomogram estimates deviations therefrom.

Graphs in the Nomogram (Figures 9-12, ibid) show Factors to compensate for four parameters, namely canyon height and width, traffic flow and speed. Figure 2 (using Figures 9-12, ibid) illustrates the method. As each parameter moves away from its standard setting, a multiplying factor is read from the graph. The four Factors are multiplied together to get their combined influence. Since parallel and perpendicular leeward concentrations behave differently, their factors appear as solid or broken curves respectively. The standard concentrations (for the correct wind speed and Parallel or Leeward) from Table 3 (Table 2e, ibid) must be multiplied by the emissions (q g/km per average vehicle) as appropriate for the traffic speed; these emissions can be taken from DMRB (1999) as illustrated in Tables 1, 2. They are then multiplied by the four Factors (Parallel or Leeward as relevant). The result is a screening estimate of the likely concentration for the Parallel or Leeward case.

Using the same conditions of Tables 1,2, and traffic speeds 40 kph and 10 kph as examples. we find the following:

1. Standard concentration of CO in Table 3 for unit source 1 g/km and wind speed 2 m/s was Parallel 0.2309 ppm CO and Leeward 0.1945 ppm CO.
2. The Factors for Height 20 m (1.0), Width 20 m (1.0), Flow 1000 v/h (0.61), and Traffic Speed 40 kph (0.75) give a

combined Parallel Factor of 0.4575. The combined Leeward Factor was 0.484.

3. At 40 kph the Emissions in Table 1 for 1000 light vehicles per hour in year 1996 were 6.41 g/km.
4. At 40 kph, multiplying together the Standard concentration, four Factors (Leeward or Parallel) and Emissions rate, give estimates of concentration: Parallel 0.68 ppm CO and Leeward 0.60 ppm CO.
5. At 40 kph, the model results in Table 1 for Parallel and Leeward are: 0.71 and 0.61 ppm CO.

Table 4 summarises the results at 40 kph and 10 kph.

The Nomogram results are reasonably close to the model results. Allowing for the uncertainties inherent in the modelling, the method is designed for rapid screening during Second Stage Reviews. The emissions data (e.g. from DMRB, 1999), with the four Factors from Figures 9-12 and concentration in Table 2e from the Nomogram (Buckland and Middleton, 1999) will suffice to estimate canyon air quality impact. Alternatively, AEOLIUSQ can be run.

6. Conclusions

1. The canyon model was coded following Berkowicz et al. (1994) and was validated in London, Birmingham and Leek. Backgrounds must be added.
2. Model simulations revealed that in a large number of polar diagrams for concentration and wind direction, the parallel case and the perpendicular leeward case were the largest concentrations.
3. The Nomogram works by plotting deviations in the parallel and perpendicular leeward extremes from a standard case.
4. The Nomogram has a table of concentrations for a standard case (unit emissions), and four factor plots. The screening estimate is a product of the four factors, the standard concentration, and a user supplied emission factor. The Nomogram and model values agree within a few percent.
5. AEOLIUSQ Emission is recommended if a computer screening model is required.
6. AEOLIUSF Full is useful for modelling hourly concentrations (up to one month at a time can be run) and these can lead to annual means and percentiles.
7. Roof top winds are crucial to the model; measurements in Leek suggest they may be about 60-70% of those at a well exposed, distant airport anemometer. The model and Nomogram do not apply any site specific adjustment to the wind. The user can apply this correction before modelling if appropriate to their situation.
8. AEOLIUSQ now seems to give larger values than the proposed DMRB (1999), in line with the idea that canyons may be more polluted than an equivalent open road. NB: This comparison assumes equivalent averaging times.
9. Users should take note of the uncertainties revealed in validation results.

AEOLIUS can be downloaded from the Met Office internet site (www.meto.gov.uk or www.met-office.gov.uk) under weather services for environment and then AEOLIUS or AEOLIUSQ. The files include documentation to explain their use.

This work was presented to a meeting of the NSCA Dispersion Model Users Group on 27 May 1999.

Acknowledgements

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Middleton D R (1999). Dispersion Modelling: A Guide for Local Authorities. Met Office Turbulence and Diffusion Note TDN 241. ISBN 0 86180 348 5 The Met Office London Rd Bracknell Berks RG12 2SZ UK.

Table 1. Model results for CO from AEOLIUSQ using a canyon width 20 m, height 20m, wind speed 2 m/s, for 1000 light vehicles per hour, and proposed DMRB (1999) emissions rates for 1996 at each speed shown. See text on averaging times. DMRB values here are 5 m from road, base case scaled in proportion to emissions

Traffic Speed km/h	1996 Emission Rate CO g/km	Parallel Concn CO ppm	Leeward Concn CO ppm	DMRB (1994) CO ppm	DMRB (1999) CO ppm
100.0	4.98	0.39	0.38	0.695	0.254
80.0	3.89	0.33	0.32	0.543	0.198
60.0	4.38	0.42	0.38	0.611	0.223
40.0	6.41	0.71	0.61	0.895	0.327
20.0	10.88	1.54	1.17	1.52	0.555
10.0	17.03	2.99	2.01	2.38	0.869
5.0	27.99	5.86	3.54	3.91	1.423

Table 2. Model results for NO_x from AEOLIUSQ using a canyon width 20 m, height 20m, wind speed 2 m/s, for 1000 light vehicles per hour, and proposed DMRB (1999) emissions rates for 1996 at each speed shown. See text on averaging times. DMRB values here are 5 m from road, base case scaled in proportion to emissions. NO_2 is from AEOLIUSQ

Traffic Speed km/h	1996 Emission Rate NO_x g/km	Parallel Concn NO_x ppb	Leeward Concn NO_x ppb	DMRB (1994) NO_x ppb	DMRB (1999) NO_x ppb	Parallel Concn NO_2 ppb	Leeward Concn NO_2 ppb
100.0	1.800	85.6	84.5	147.	55.9	33.7	33.5
80.0	1.466	76.2	72.8	120.	45.5	32.0	31.3
60.0	1.219	70.9	64.9	99.7	37.9	30.9	29.6
40.0	1.056	71.4	61.2	86.4	32.8	31.1	28.8
20.0	0.978	84.3	64.0	80.0	30.4	33.4	29.4
10.0	0.990	105.7	71.1	81.0	30.8	36.5	31.0
5.0	1.049	133.7	80.7	85.8	32.6	39.3	32.8

Table 3. Concentrations for the 'standard case' taken from Table 2e in Buckland and Middleton (1999). The source strength was 1.0 g/km, traffic flow 2000 v/h, traffic speed 5 m/s (18 kph), canyon height 20 m and width 20m. Concentration units were converted using temperature 15C, and standard atmospheric pressure. Their paper (ibid) has the full set of tabulated values.

Results $\lambda = 0.1$	Parallel	Leeward
Wind Speed (m/s)	CO (ppm)	CO (ppm)
2	0.2309	0.1945
Wind Speed (m/s)	NOx (ppb)	NOx (ppb)
2	140.571	118.399

Table 4 (opposite)

Figure 1. Idealised view of recirculating vortex for a cross wind perpendicular to the street; the Leeward side is modelled with a larger concentration than to windward; Buckland (1998).

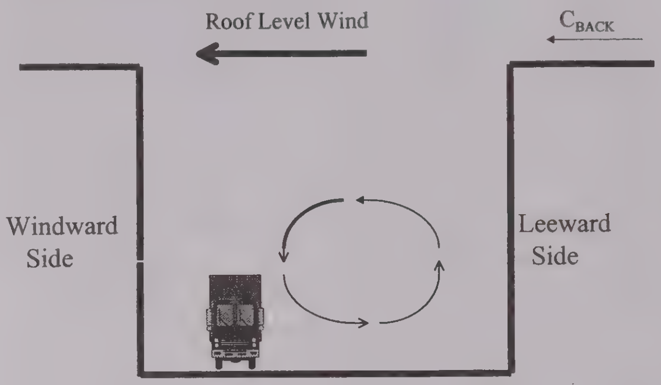


Figure 2 (opposite).

Figure 3. Lightweight propellor anemometers on roof top mast used in the joint Met Office/Staffordshire Moorlands District Council study of roof top winds and canyon pollution in Leek; Manning et al. (1999).

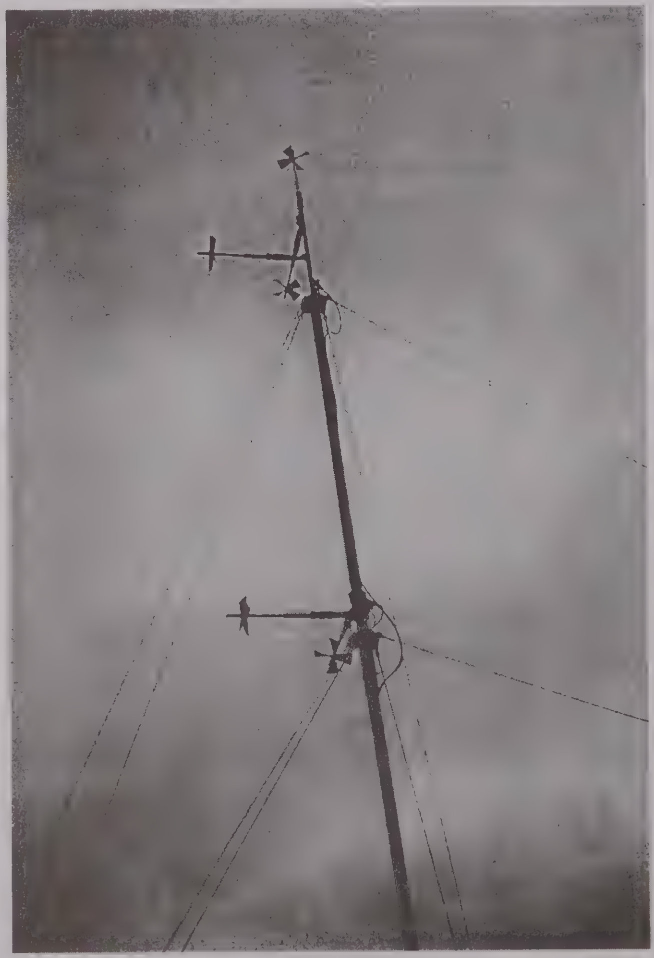
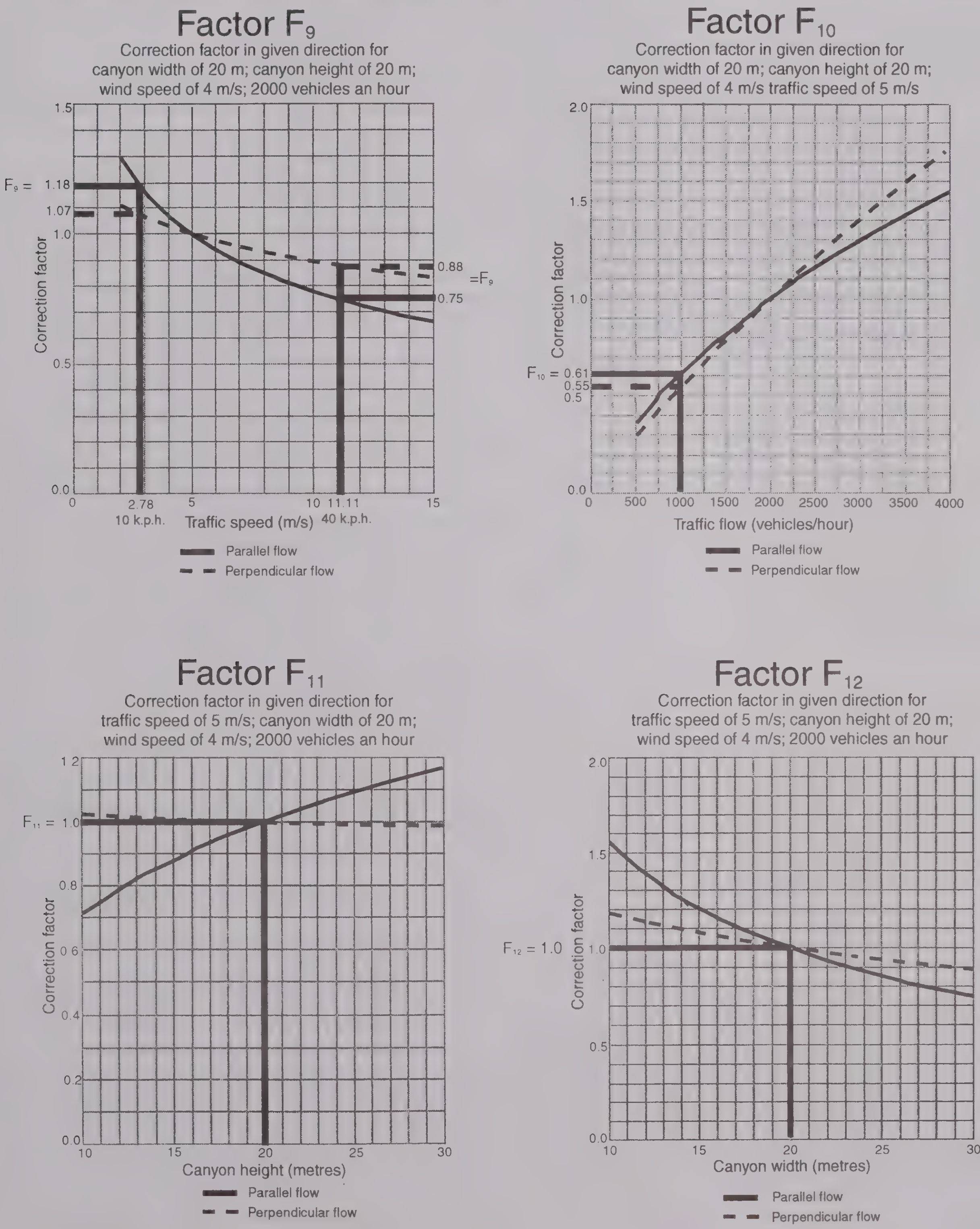


Table 4. Summary of results from AEOLIUSQ, Nomogram, and DMRB; conditions as in Tables 1, 2.

Traffic Speed Km/h	**Emission 1996** CO g/km	Model Parallel CO ppm	Nomog Parallel CO ppm	Model Leeward CO ppm	Nomog Leeward CO ppm	DMRB (1994) CO ppm	DMRB (1999) CO ppm
40.0	6.41	0.71	0.68	0.61	0.60	0.895	0.327
10.0	17.03	2.99	2.83	2.01	1.95	2.38	0.869
Km/h	NO_x g/km	NO_x ppb	NO_x ppb	NO_x ppb	NO_x ppb	NO_x ppb	NO_x ppb
40.0	1.056	71.4	67.9	61.2	60.5	86.4	32.8
10.0	0.990	105.7	100.	71.1	69.0	81.0	30.8

Figure 2. Nomogram correction factors being read from the Nomogram curves; Figures 9-12 in Buckland and Middleton (1999).



Factor F_9

Correction factor in given direction for canyon width of 20 m; canyon height of 20 m; wind speed of 4 m/s; 2000 vehicles an hour

Factor F_{10}

Correction factor in given direction for canyon width of 20 m; canyon height of 20 m; wind speed of 4 m/s traffic speed of 5 m/s

Factor F_{11}

Correction factor in given direction for traffic speed of 5 m/s; canyon width of 20 m; wind speed of 4 m/s; 2000 vehicles an hour

Factor F_{12}

Correction factor in given direction for traffic speed of 5 m/s; canyon height of 20 m; wind speed of 4 m/s; 2000 vehicles an hour

DEVELOPMENT OF A GREEN FLEET AWARD BY WINCHESTER CITY COUNCIL

Robert Heathcock

Winchester City Council

This paper describes the work undertaken by the Environmental Health Service of Winchester City Council in developing a ***Green Fleet Award*** *scheme for operators of vehicle fleets who regularly use the City Council's district for access or journeys. The development of the scheme offers an innovative approach to tackling air quality within cities and supports national approaches linked to the Government's air quality strategy including local air quality management, roadside emission testing and vehicle management practices. Whilst only recently established, the scheme is already of considerable interest to national organisations and Government in its approach to this subject. It is hoped that the details given in this paper will help others to learn from Winchester's experience and assist them in following their example.*

Background Information

There is increasing national interest in the issue of air quality following the publication of the Government's National Air Quality Strategy for the United Kingdom in 1997 and the ongoing process of local air quality reviews under the Air Quality Regulations 1997. Whilst there are a number of sources of air pollution which have an impact upon UK air quality at both a local and national level, it is recognised that motor vehicles represent the most significant source for cities.

Set against this background, there have been a number of national campaigns and approaches in tackling emissions from vehicles in order to improve air quality. Such initiatives have included the Government's "Don't Choke Britain" campaign and the NSCA's 'Dirty diesel' campaign which have been supported by a number of local authorities. Whilst Winchester City Council have participated in such campaigns in the past, they were concerned that they tended to focus solely on the negative aspects of vehicle emissions and therefore created a more confrontational relationship with fleet operators. Staff in the Environmental Health Service had an increasing desire to develop a more positive partnership-based approach to tackling vehicle emissions, which would recognise good practice amongst responsible fleet operators and encourage others to follow their example. However, they recognised that such an approach would still have to be supported with enforcement based publicity campaigns for those operators who were not prepared to take any action to clean up their emissions.

Consultation Process

Before embarking on the development of the campaign details, it was recognised that consultation with fleet operators was essential. In February 1998, a selection of local fleet operators were invited to a workshop in Winchester. Invited representatives were initially limited to operators of HGV, commercial and large public service vehicles as it was intended that the campaign would focus solely on larger diesel-engined vehicles, particularly buses which were perceived by the public as being a problem.

Over 20 operators attended the workshop from a wide cross-section of sectors including the bus companies, retailers and public service organisations (police, fire and ambulance). Operators were asked for their views on whether the proposal to establish what was initially labelled as a 'Clean Diesel Campaign' would be welcomed and, if so, how they saw the initiative developing including which areas could be used as the basis for the award criteria.

Operators who attended the workshop were very enthusiastic about the campaign to the extent that they suggested that it should be extended to other fleets including cars and light vans irrespective of fuel type. Expansion of the scheme to these latter categories meant that major employers and car fleet operations would be included as well as trucks and buses. This seemed a logical expansion of the scheme so was therefore included. Volunteers were sought from those attending the workshop to sit on an aptly named Steering Group to develop the scheme and its criteria in more detail.

Development of the Award Criteria

Over the next six months the Steering Group of representatives from the retail, public service, and bus company sectors developed a set of draft award criteria and considered how the scheme would operate in practice. All members of the Steering Group agreed that the campaign should focus on overall fleet management practices rather than just purchase of alternatively fuelled vehicles. The Group considered that successful fleet management to minimise emissions included wider aspects than purely technical considerations.

As the scheme was developed in more detail the criteria were refined and updated as wider consultation clarified the practicalities of evaluating each area. New areas were added including commitment from management to the process and the availability of sufficient resources to deliver plans and targets - seen as an essential requirement in delivering good fleet management practices.

It was also agreed that different levels of award should be provided within the scheme to allow for smaller fleet operators or those with minimal resources to begin the process by applying for the lowest level of award. Three levels of award were therefore developed to allow for progression within the scheme:

- **Bronze** award as an entry-level award, where companies could begin to address the basics;
- **Silver** award for operators who could demonstrate that a significant amount of progress had been made in addressing the environmental impact of vehicle emissions;
- **Gold** level award for companies demonstrating that they were following all areas of what was considered to be best practice in minimising vehicle emissions.

In considering the detailed process of how the award scheme would function, the Steering Group agreed that an independent Recognition Panel should be established to make decisions on whether an award was granted or not. The Panel would also decide which level was appropriate. Prior to this, assessment of applications would be undertaken by Environmental Health Service staff and the findings referred to the Panel for consideration. Potential Panel members would be drawn from a wide cross-section of the transport community, environmental organisations and other stakeholders who had an interest in air quality and transport issues.

Over several months, the final draft of the award criteria was developed and circulated amongst the original workshop participants for comment. Following consideration of these responses, the criteria were finalised into nine areas as follows:

- **Commitment:** the Recognition Panel expects to see evidence of the commitment of the organisation to the ***Green Fleet Award*** as this dictates the amount of action taken to minimise vehicle emissions.
- **Vehicle Maintenance:** emissions from vehicles are often dependent on how the engine is running, tyre pressures and the condition of the vehicle etc. All of these factors linked to proper maintenance allow for the more efficient running of the vehicle.
- **Emissions:** operators are expected to meet legal standards for their vehicles and have systems in place to check that these are being adhered to. The higher the level of award, the more comprehensive management systems are required to deal with any problems that might occur.
- **Fuels:** fuel choice has a key part to play in the pollutants emitted from vehicle engines. Fuel consumption must be monitored so that problems can be identified and targeted for action at the earliest opportunity.
- **Fleet Management:** avoiding unnecessary journeys and ensuring that vehicles are run as fully loaded as possible helps avoid the number of journeys made, thereby reducing the overall environmental impact of a vehicle fleet.
- **Driver Training:** vehicle engines are at their most efficient, and therefore least polluting, within certain load factors and careful driving can ensure that this is achieved as much as possible during routine use. This requires training and assessment but can lead to reductions in fuel consumption and business costs.
- **Innovation:** the best vehicle operators have to ensure that they keep abreast of the latest developments in technology to address the problems of vehicle emissions.
- **Future Plans:** good vehicle management means planning the next developments in minimising vehicle emissions to ensure that sufficient resources are available to meet these needs.
- **Self-Auditing:** the best operators are expected to not only meet the minimum legal requirements as part of their plans to minimise the environmental impact of their vehicles, but also to ensure that checks are made on current performance so that comparisons can be made against their plans. This way, problems can not only be avoided, but also addressed at the earliest opportunity.

It was felt that the last criterion was particularly important as some form of self-auditing would be an important process for the most successful operators.

By now the final title of the scheme had been agreed as the ***Green Fleet Award*** scheme and the National Society for Clean Air and Environmental Protection agreed to endorse the approach as they saw real synergies with the process and their own work. In particular, the scheme fitted well with a project to consider the practicalities of using 'low emission zones' as a tool in relation to air quality management. The City Council was invited to become a member of the low emission zone project team and to receive information and details of the project for comment and information. At this time, contact was also made with potential members of the Recognition Panel to gain their commitment and support.

By August 1998, the scheme's criteria had been finalised and agreement obtained from a number of members of the Recognition Panel. The next stage was to expand each criterion into more specific detail to clarify the evidence required for an award. This process was undertaken during the autumn and followed more detailed consultation with the Steering Group Members and the Freight Transport Association who had agreed to sit on the Recognition Panel. Discussions were also held with the Clean Vehicle Taskforce of the Department of Transport, Environment and the Regions (DETR) who expressed an interest in the approach. They agreed that the approach was pragmatic in addressing the issues and wished to be kept informed of developments as they considered it might have scope to be replicated nationally as a means of improving local vehicle emissions. The DETR also agreed to provide the foreword to the scheme's guidelines in time for the launch event.

Scheme Launch Event

The scheme was officially launched on 26 May 1999 at a Press photo call and launch ceremony in the Winchester Guildhall and attracted considerable local media interest including television and local press. The Award was also covered in the internal publications of both Tesco and the Police, the trade magazine 'Vehicle Fleet Management' and was recently featured in Radio 4's 'You and Yours' programme.

Over 70 fleet operator representatives attended the launch event and were presented with the Award scheme guidelines and application forms etc. The Deputy Chief Constable of Hampshire Police gave a fleet operator's view of the scheme and an exhibition was available for fleet operators to discuss the possibility of applying for an Award in more detail. The Award event also included the City Council's own recently purchased bi-fuel Dog Control Van which was available for inspection.

How the Scheme Works

The process of applying for an award and consideration thereof is described below:

1. Application

Applicants submit an application consisting of the following:

a. An application form giving details of the company, contact name etc.

b. Two copies of a detailed application which is restricted to no more than 10 sides of A4, including a one page summary of the main parts of the application and explaining why the company feels it deserves a Green Fleet Award. The remainder of the application should demonstrate how the company is following each of the award criteria.

c. One copy of the supporting evidence justifying the statements made in the detailed application.

The application also provides background information about the applicant's organisation, including:

- The organisation's history;
- How many vehicles are included within the fleet;
- Any financial restrictions affecting the company and fleet operations;
- Any future plans;
- Any special factors that they feel the Recognition Panel should be aware of.

Applicants are advised to ensure that supporting evidence is cross-referenced to the detailed application in order to help assessors better understand the details of the application and find the appropriate evidence. The amount of evidence required varies from operator to operator but is limited to a maximum of one A4 box file.

2. Assessment

Initially, an assessor marks the application and examines the supporting evidence. Once this process has been completed, the assessor decides whether the granting of an award might be appropriate. If so, a visit to the site will be arranged to carry out a more detailed audit to confirm the details of the original submission.

During the site audit, the assessor can ask additional questions arising from the application and check particular details of the submission. The assessor can ask for additional evidence, which is either provided during the visit or sent on shortly afterwards.

Based on the findings of the visit, the assessor comes to a decision regarding the level of award that might be appropriate. In some cases, this may be a higher level of award than was originally requested.

3. Decision

After the site audit the assessor prepares a written report on the findings for submission to the next meeting of the Recognition Panel for consideration. The Recognition Panel considers the assessor's report and makes a final decision on whether an award is granted or not and at what level.

Representation on the Recognition Panel includes:

The Energy Savings Trust Powershift programme
The Freight Transport Association
Southampton Environment Centre
Hampshire County Council Bus Contracts staff
Chair of Environmental Health, Winchester City Council
Senior Environmental Health Manager, Winchester City Council.

It is also proposed to seek representation from The Association of Car Fleet Operators who have indicated a willingness to sit on the Panel.

Before making a decision on whether to grant an award or not, the Recognition Panel will consider whether the applicant:

- is addressing the issue of the environmental impact of vehicle operations in a considered and structured way.
- has or is considering how the fleet management practices and financial management of the company can support such plans.
- has plans to address such issues and that as far as possible these are adhered to or where they are not, a clear explanation is available.
- is meeting the legal requirements for vehicle emissions and transport operations.
- is committed to improving their performance in the future.

4. Notification

Following the Recognition Panel's decision applicants are advised of the outcome of their application and receive written feedback on their performance against the award criteria. They also have the opportunity to discuss this further if they wish to clarify the findings. The feedback is designed to provide useful information to operators on future initiatives in order to either meet the basic standards of the award, or progress to a higher level.

There are no limits on the number of awards granted and these will be presented each year at an award ceremony, which will be well publicised by the City Council. Winners receive a signed Award Certificate and stickers for their vehicles, although the numbers of these are limited to a reasonable amount but additional stickers for larger fleets can be purchased if required.

Next Steps

Following the launch event, follow-up contact is being made with over 20 potential applicants. It is also planned to carry out assessments of Stagecoach South Ltd, Hampshire Constabulary and Tesco plc who have already committed themselves to applying for an award before the 1999 closing date of 1 October. Assessments and audits will be undertaken during the autumn and recommendations for awards referred to the Recognition Panel, which will meet in February 2000 ready for an award ceremony on 24 May 2000. At present, Phillipa Forrester of the BBC's 'Tomorrow's World' Programme has agreed to attend the ceremony and present the awards.

In addition, a number of extra innovative approaches to encouraging the use of cleaner vehicles are being considered to support the scheme including the availability of free car parking within Winchester for alternatively fuelled vehicles. There are also plans to encourage replacement of other fleet vehicles within the City Council with alternatively fuelled vehicles. The Parking Enforcement Service has already purchased a bi-fuel vehicle for its own use.

Conclusions

Completion of local air quality reviews and assessment will present local authorities with a challenge in finding practical mechanisms to help achieve air quality objectives. Whilst there are a number of initiatives that can only be tackled nationally (such as vehicle excise duty, taxing of car parking spaces etc) local authorities are in a prime position to influence the emissions from vehicles operating locally.

It is hoped that the development of schemes such as Winchester's ***Green Fleet Award*** scheme can help to begin to address this issue and offer some encouragement to other local authorities wishing to adopt a similar approach.

Anyone interested in obtaining further details of the ***Green Fleet Award*** scheme should contact Robert Heathcock, Senior Environmental Health Manager at Winchester City Council on 01962 840222, extension 2476 or via e-mail at Rheathcock@winchester.gov.uk.

DOES MY SCHOOL REALLY CAUSE THAT MUCH POLLUTION!

Samuel Bull and Michael Bull

Langton Green County Primary School

Lampington Row, Tunbridge Wells, Kent

This article provides a good example of what can be achieved by primary school children in investigating and understanding local air pollution issues. If readers are aware of similar work being carried out in their area, on any environmental topic but especially air pollution, noise or sustainable development, please contact Tim Williamson, Commissioning Editor, Clean Air at the NSCA offices or at twilliamson@nsca.org.uk

In common with many other primary schools, Year 5 pupils at Langton Green Primary School must carry out a project of their choice. The subjects selected by the pupils cover many areas of the curriculum, but as one of this year's class topics had been pollution, we decided to look at how much pollution came from the school. We looked at water and solid pollution but the main area examined was air pollution from the use of the school. In this short article we describe the project and some of the results.

Methods

Langton Green County Primary School is a state school of some 230 pupils on the outskirts of Tunbridge Wells, Kent. The school is divided into seven classes each with a class teacher plus other support staff. Most of its pupils come from the suburb of Langton Green although a significant minority lives over 4km from the school. The school run is often noted as one of the factors that has shown a marked increase in recent years, the proportion of children travelling to school by car has increased substantially from around 15% to over 50% of 10 year olds in recent years. It was therefore decided that we would look at how each pupil travelled to school, the distance travelled, the types of car used and whether any public transport option was available. We also wanted to compare the transport pollution with other air pollution sources such as the gas and electricity used in the school.

Questionnaires were sent to a sample of pupils and the staff at the school to find out all the travel information detailed above. A second questionnaire was sent to the school administrator to determine the energy and water usage of the school. The size of the rubbish bins was measured, how often they were emptied and the type of wastes thrown away were noted.

Results

The results of the questionnaires returned from pupils and staff showed that some 85% of the pupils and all the staff used cars to travel to and from the school. Walking to school was almost totally confined to those who lived within a few hundred metres of the school. All the teachers at the school lived over 5km from the school so their choice of travel mode was not surprising. However, for the pupils the average distance to school was just over 2km but many of the car journeys were less than 1km (see Figure 1). On average there were approximately two pupils in each car although 30% of the cars had just a single person travelling to the school (Figure 2). Using these figures we calculated that the school run accounted for some 70,000km travelled each year.

Using these travel figures and the energy consumption together with emission factor data from the London Research Centre database and the National Power website (both on the internet) it was calculated that the school produced the following:

- Carbon dioxide - 35.5 tonnes/year
- Nitrogen oxides - 128 kg/year
- Carbon monoxide - 100 kg/year
- Sulphur dioxide - 100 kg/year

Figures 3 and 4 show the relative proportions emitted from each of the main sources. Perhaps surprisingly, travel is not the major emitter of the greenhouse gas carbon dioxide, the energy used on-site being the main source. We should therefore look at energy reduction measures on the school site as a significant method of reducing overall emissions. However, transport is the main source of most of the pollutants with local impacts such as nitrogen oxides and carbon monoxide.

The figures, although not large in a national context, show that even a relatively small primary school can be responsible for significant pollution emissions. It should be noted that the transport pollution is produced for two short periods of about 30 minutes during each day and therefore during these times is contributing significantly to local pollution levels. The school is one of several primary schools in the area and, if one were to take these into account as well, the total emissions begin to reach locally significant levels.

Combining these air pollutant emissions with some 6 tonnes of solid wastes, and the $560m^3$ of polluted water produced, gives the impression the school is equivalent to a small industrial process.

Conclusions

The use of the school results in emissions of air pollutants that are significant in a local context and there is significant potential to reduce overall emissions, not just from reduction in car travel, but also from reducing energy use on-site. However, to the regret of one of the authors, closure of the school is not envisaged as a potential air quality improvement strategy for the area.

Acknowledgements

The authors are grateful to the staff, parents and pupils of the school and Tunbridge Wells Borough Council for providing the information required for this study.

Samuel Bull is a pupil at Langton Green County Primary School. Michael Bull is an environmental consultant specialising in air quality issues.

Figure 1. Distance to School (km)

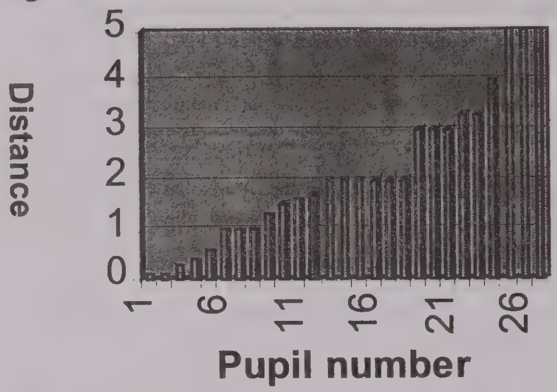


Figure 2. Number of Pupils in Car

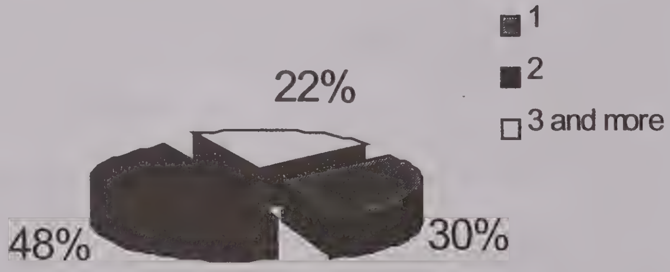


Figure 3. Sources of Carbon Dioxide

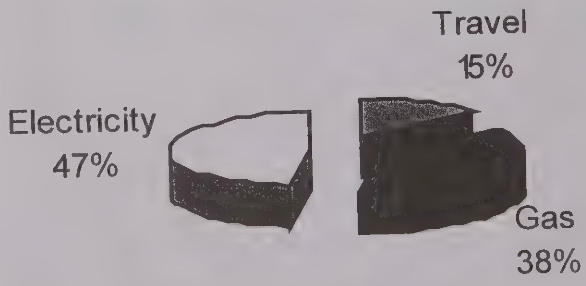
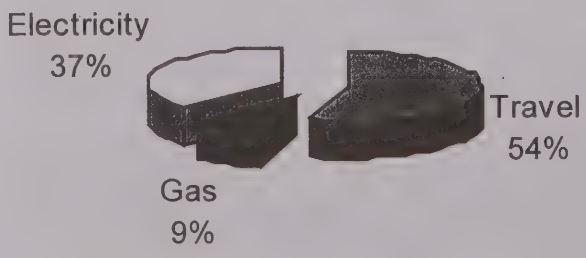


Figure 4. Sources of Nitrogen Oxides



Update

The Air Quality Strategy for England, Scotland, Wales and Northern Ireland: A Consultation Document

At the end of August, DETR published the consultation draft of the revised Air Quality Strategy for England, Scotland, Wales and Northern Ireland, with a deadline for responses of 22 October 1999. This marks what is effectively the half way point in the somewhat protracted process of revising the original National Strategy of 1997 and the associated air quality objectives. The final version of the revised strategy will appear early in the new year with the Air Quality Regulations being amended as necessary presumably around the same time.

The draft Strategy covers broadly the same ground as the previous consultation document, Review of the National Air Quality Strategy, published in January this year, although the space devoted to each has changed. Most notably, there is no longer a section on cost and benefits of the air quality objectives and the technical background has been expanded, as has the section on policies to achieve the objectives. (see Tables 1 and 2.)

As for the objectives themselves, there have been some amendments to the proposals put forward in January but these have been presentational rather than an actual change in the concentrations, allowable exceedances or compliance dates. Following widespread comment, the proposal to set indicative levels has been dropped and all concentrations are given in $\mu g/m^3$ or mg/m^3, rather than ppb or ppm, in line with the EU Daughter Directives. Finally, the tolerance limits attached to the objectives are now expressed in allowable exceedances per year, rather than percentiles, which should make them easier to understand for the non-technical audience.

Another helpful addition to the Strategy is in the Introduction Chapter, which clarifies the purpose and scope of the document, and also sets out the principles by which the Strategy is guided. The nine general principles, upon which UK air quality policy is based, are as follows:

- Sustainability
- Effects-based approach
- Polluter pays principle
- Precautionary principle
- Taking account of costs and benefits
- Risk assessment
- Using scientific knowledge
- Subsidiarity
- Effective international monitoring and enforcement.

The NSCA Air Quality Committee is preparing a detailed response to the Draft Strategy and welcomes any comments which members may wish to add to the debate. Copies of the Strategy can be obtained from:

DETR Free Literature
PO Box 236
Wetherby
LS23 7NB
Tel. 0870 1226 236
Fax 0870 1226 237

New Air Pollution Agreement

After six days of negotiations, diplomats from more than 30 countries reached agreement on a new Protocol that will set binding national emissions ceilings for four air pollutants which conribute to acidification, eutrophication and ground-level ozone.

The draft text will form a new Protocol under the Convention on Long Range Transboundary Air Pollution and is scheduled to be formally adopted and signed by environment ministers in Sweden at the end of November.

The Protocol, which will then require formal ratification before it can come into force, will limit total emissions from each country by setting binding national emission ceilings for sulphur dioxide, nitrogen oxides, volatile organic compounds and ammonia, to be achieved by 2010. This is the first time that emissions of ammonia - which come primarily from the storage and spreading of manure and fertilisers on agricultural farms - have been subject to international control; indeed for most participating countries, it will be the first time that agricultural ammonia emissions have been regulated at all. The Protocol also contains emission and fuel standards for both stationary and mobile sources.

For the European Union, the Protocol requires the following overall emission reductions by 2010, based on 1990 levels:

- Sulphur dioxide: -75%
- Nitrogen oxides: - 49%
- VOCs: -57%
- Ammonia: -15%

(Information from The Swedish NGO Secretariat on Acid Rain)

EPAQS and PAHs

The Ninth report of the Expert Panel on Air Quality Standards was published during the summer. It recommends, taking benzo[a]pyrene as a marker for the total mixture of polycyclic aromatic hydrocarbons in the UK, an air quality standard of $0.25 ng/m^3$ B[a]P as an annual average. This the Panel believes would reduce the risk to the population from exposure to PAHs to "so small as to be undetectable".

Because of the uncertainties surrounding the use of B[a]P as a marker for carcinogenic PAHs in the ambient air, the Panel also recommends that the number of monitoring sites for PAHs in the UK should be expanded, particularly in areas likely to be affected by industrial emissions.

Copies of the EPAQS report on PAHs are available from The Stationery Office, and accredited agents, price £9.99 each.

The Air Quality strategy for England, Scotland, Wales and Northern Ireland

Table 1: Objectives to be included in Regulations for the purposes of Local Air Quality Management

Pollutant	**Objective**		**Date to be achieved by**
	Concentration	*Measured as*	
Benzene	16.25 µg/m^3 (5ppb)	running annual mean	31st December 2003
1,3-Butadiene	2.25 µg/m^3 (1ppb)	running annual mean	31st December 2003
Carbon monoxide	11.6 mg/m^3 (10ppm)	running 8 hour mean	31st December 2003
Lead	0.5µg/m^3	annual mean	31st December 2004
	0.25 µg/m^3	annual mean	31st December 2008
Nitrogen dioxide	200 µg/m^3 (105ppb), 18 epy	1 hour mean	31st December 2005
	40 µg/m^3 (21ppb)	annual mean	31st December 2005
Particles (PM10)	50 µg/m^3, 35 epy	24 hour mean	31st December 2004
	40 µg/m^3	annual mean	31st December 2004
Sulphur dioxide	350 µg/m^3 (132ppb), 24 epy	1 hour mean	31st December 2004
	125 µg/m^3 (47ppb), 3 epy	24 hour mean	31st December 2004
	266 µg/m^3 (100ppb), 35epy	15 minute mean	31st December 2005

Conversions of ppb and ppm to µg/m^3 at 20 °C and 1013mb; objectives for nitrogen dioxide are provisional; epy = allowable exceedances per year

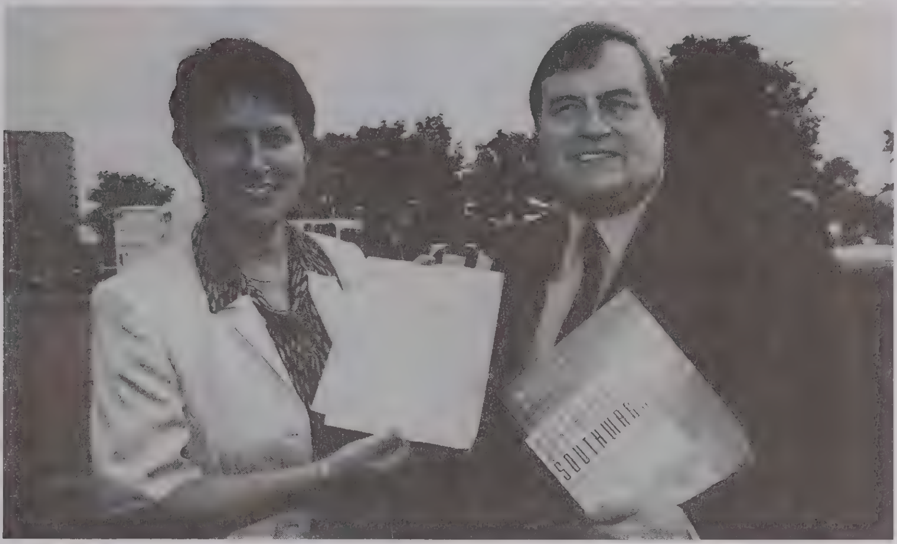
Table 2: National Objectives not to be included in Regulations for the purposes of Local Air Quality Management

Pollutant	**Objective**		**Date to be achieved by**
	Concentration	*Measured as*	
Objectives for the protection of human health			
Ozone	100 µg/m^3 (50ppb), 10 epy	8 hour running mean	31st December 2005
Objectives for the protection of vegetation and ecosystems			
Nitrogen oxides	30 µg/m^3 (16ppb)	annual mean	31st December 2000
Sulphur dioxide	20 µg/m^3 (8ppb)	annual mean	31st December 2000
	20 µg/m^3 (8ppb)	winter average (1st Oct.-31st Mar.)	31st December 2000

Conversions of ppb and ppm to µg/m^3 and mg/m^3 at 20°C and 1013mb; objective for ozone is provisional; epy = allowable exceedances per year

Members News

Members! Are we covering your news? Please check that your press office has *Clean Air* on its mailing list.



One of NSCA's centenary sponsors, **Casella Group** has acquired SGS Environment, the environmental consultancy specialising in GIS-based air quality management systems and EMS auditing. Casella is actually celebrating 200 years of trading this year. The group is growing rapidly, and includes **GMSS** (analytical services) and **CEL** (noise and vibration services). 01234 84410 0 / www.casella.co.uk.

The **South East Institute for Public Health (Seiph)** has merged with the School of Health and Life Sciences at King's College London. Well known for its work in air quality research and consultancy, Seiph will be closely involved with the new inter-departnmental research group, the Centre for Environmental Assessment and Management at King's (CEAMAK). NSCA Vice President and past Secretary General Dr Tom Crossett is currently Acting Director of Seiph. 0171 872 3202.

Copies of the Exxon 1999 Environment, Health and Safety Progress report are available from **Esso UK** on 01372 222000, with more information on www.esso.co.uk.

The reason Deputy Prime Minister John Prescott is looking so cheerful is that his car has passed an emissions test carried out by **Southwark Council**. The DPM launched the latest consultation on the national Air Quality Strategy in Southwark, recognising the Council's use of gas and electric powered vehicles.

The **Society of Motor Manufacturers and Traders** collaborated with UK motor manufacturers in September to run a nationwide free vehicle emissions checking programme using the campaign name "Stop Fuming!". **Ford** provided three Transit based mobile testing units that visited branches of **Safeway** to carry out the tests. Ford contact: 01277 2552183 http://media.ford.com.

London Borough of **Newham** has had hundreds of replies to a series of six "issue papers" called *Environment Matters*. The papers have been used to gauge public opinion on sustainability issues, including: Waste; Environmental Awareness; Energy and Water Efficiency; Transport and Air Quality; Natural Environment, Towns and Neighbourhood; Meeting Local Needs, Health and a Vibrant Economy. Information from Peter Gay 0181 472 1430 ext 22209: www.newham.gov.uk/environment/greenmenu.htm.

Sainsbury's distribution centre in Basingstoke has become the first of its type to achieve registration to the European Eco-Management and Audit Scheme (EMAS). The site was part of a EU-funded trial for EMAS to be made applicable to non-manufacturing sectors. Improvements to lighting, refrigeration and recycling systems have been introduced as a result. See www.emas.org.uk and www.j-sainsbury.co.uk/environment/whatsnew.htm.

Divisional News

Seventy-five members and guests attended the AGM of the **East Midlands Division** held in Mansfield. Dr Mary Newlands was re-elected as Chairman, with Roy Smith as Deputy Chairman, and Bill Pearce celebrating his fifth year as Divisional Secretary. Retiring Auditor Gordon Yates was presented with a Certificate of Commendation and engraved wine goblets by the Chairman.

The meeting was given three presentations on air quality issues from Alex Newton and Graham Marsh of the Environment Agency, and Alan Batty from Bassetlaw DC. Following lunch, visits were made to the local sewage works, Mansfield Brewery and the Mansfield & District Crematorium.

The **South West Division's** centenary celebration will be held at the Gloucestershire County Cricket Club ground in Bristol on 9 December. The morning session will be on contaminated land and the afternoon on air quality. More details from David Muir, Email david_muir@bristol-city.gov.uk.

NSCA Scotland

SCOTLAND'S HEALTH AND THE ROLE OF THE ENVIRONMENT

This one day seminar, which attracted around 60 delegates from a variety of health-related professions, was held recently within the conference facilities at Hamden Park, Glasgow - Scotland's national football stadium. The event was jointly promoted by NSCA (Scotland) and the Scottish Centre for Infection and Environmental Health (SCIEH) and built on the recently published Government White Paper "*Towards a Healthier Scotland*". In spite of the title, the seminar was not confined solely to the Scottish situation. Indeed, in these days of social inclusion and a more holistic approach to health, many of the key points raised are applicable throughout the United Kingdom. These points covered a range of environmental health issues with many speakers illustrating the need for a variety of disciplines to work in partnership with each other to improve health.

The morning session was chaired by Professor Mike Jackson, Professor of Environmental Health at the University of Strathclyde and covered aspects of policy and the systems available to tackle many of the problems relating to modern public health issues. The session was opened by Jim Brown from the Scottish Executive (formerly Scottish Office). He recognised that public health was now a priority and stated that whilst Scotland's health record had improved it remained comparatively poor, particularly so in impoverished areas of Scotland. This was the background to the publication of the "*Towards a Healthier Scotland*" White Paper. Three main areas are to be tackled - health and equalities, children and young people, and coronary heart disease and cancer. Jim Brown also touched on three specific areas with regard to the environment - water, air pollution and housing - all of which have an acknowledged impact on health in Scotland. The importance of partnerships was stressed with a recognition that even within the Scottish Executive, a number of Departments can input into health improvements, e.g. Transport, Education, Environment. Outwith the Scottish Executive, other bodies such as local authorities, the Scottish Environment Protection Agency (SEPA), Scottish Natural Heritage (SNH), Health Boards and local communities can all contribute to health issues. Finally, the need for individuals to play their part was highlighted using as an example their choice of mode to travel.

Councillor Norman Murray, President of the Confederation of Scottish Local Authorities (COSLA) then spoke of the role of local authorities in the public health area in Scotland. Particularly welcome for him in the White Paper was the endorsement of the importance of joint working between the many sectors with a part to play in improving public health. COSLA believe that any Strategy that aims to address inequalities in health will only be really effective if it involves Councils directly working in partnership with health authorities. Councillor Murray explained that the impact that local authorities could have on communities was threefold: by direct action on the social, economic and environmental influences on health; by tackling inequalities; and by working with partner agencies to promote better health. COSLA, in fact, are hoping to launch soon Guidance for Councils on the key issues around public health and the local authority corporate responsibility. COSLA's Guidance will also describe the contribution of many Council services in improving public health - education, social work, housing, environmental health, planning, building control, consumer and trading standards, cleansing, leisure and recreation, libraries, parks, direct care and health promotion. Councillor Murray then spoke of the existing public health roles that local authorities have stressing the National Air Quality Strategy and traffic management as examples.

George Morris from SIEH then spoke on the need for greater surveillance of environmental health data in order to identify appropriate environmental controls. Public awareness of environmental issues has been on the increase over the past number of years. The interest in the impact of the environment on health is regularly seen in reports on subjects such as air pollution, nuclear power, radon and electromagnetic radiation. Unfortunately, despite this interest, there is no routine surveillance system in existence to collate and interpret the large amount of environmental data collected by a host of organisations and institutions. Compare this to the situation with communicable diseases. George Morris put forward a case for establishing a national routine surveillance system, though he acknowledged that a number of difficulties existed. These included the need to relate environmental data to population exposure, the presence of confounding factors in environmental epidemiology and the multi-causal nature of disease and the importance of recognising historical exposures. His colleague, Dr Anthony Breslin, then described a pre-pilot project which had involved one Health Board and five local authorities in the West of Scotland. This utilised NO_2 results from 31 sites and cardiac, respiratory and cancer hospital admission data from the same area. Dr Breslin also described plans for a larger pilot scheme which would involve three Health Boards and ten local authorities looking at NO_2, PM_{10} and SO_2 data and a wider range of hospital admissions. Following this the ultimate aim would be to create a baseline Environmental Health Surveillance system.

Dr Margaret Douglas of Lanarkshire Health Board considered the role of health impact assessment (HIA) in ensuring public policies protect and improve the health of the population. HIA is defined as the systematic evaluation of the effects of policies, programmes and projects on health at a population level. Dr Douglas went on to describe an example of an HIA in practice which looked at three different scenarios for transport policy in Edinburgh. Some health impacts are more immediately obvious than others. In this example the main health impacts were through accidents, pollution (air and noise), access to services, community networks and employment and business. Thus HIA was able to conclude which sectors of the population would gain or lose most in health terms from each scenario.

The morning ended with a healthy question and answer session. The main points which arose from this were a concern over whether there were sufficient resources being made available to accommodate the necessary public health measures. Secondly, with regard to mobile telephone masts, local authorities in Scotland seemed to be operating independently with responses to these varying between Councils. It was suggested that greater uniformity could be achieved if COSLA were to issue their own guidance for local authorities. Councillor Murray was able to reassure the audience that this would be forthcoming.

After lunch, and a tour of the stadium, the afternoon session was chaired by Professor Rajinder S Bhopal, Chair of Public Health at the University of Edinburgh. In this session three speakers covered their own specialist environmental subjects, namely air pollution, water quality and contaminated land.

Dr Raymond Agius of the University of Edinburgh discussed the current knowledge with regard to the health effects from air quality. He then went on to describe epidemiologic work that had been conducted in Edinburgh. This had shown that particulate pollution is associated with an increased risk of mortality in the elderly from respiratory (and possibly other) causes as well as an increased morbidity (as shown by emergency hospital admissions) from cardiovascular causes. Overall these effects are small, being up to 5% of the background frequency of these adverse health outcomes for every 10 $\mu g/m^3$ rise in particulate pollution. One of the main challenges, he felt, in current research is to investigate possibly significantly greater susceptibility to air pollution in subsets of the population who are already ill, or vulnerable for other reasons.

Issues relating to water quality with relevance to health were then highlighted by Dr Colin Ramsay of SCIEH. In this he assessed the implications of the new EC directive on Water Quality. This aims '*to protect human health from adverse effects of any contamination of water...by ensuring it is wholesome and safe*' Reductions are proposed for levels of copper, lead, nickel, nitrate and PAHs in water. The new directive target of 10μg/1 for lead was the most significant issue for Scotland as to achieve this implies the removal of all lead piping. In the United Kingdom it is estimated this will cost £10 billion to Water Authorities and domestic consumers. Dr Ramsay then identified two water-related priorities from the '*Towards a Healthier Scotland*' White Paper. These were the provision of clean water and efficient sewerage services and the fluoridation of the water supply to improve the dental health of children, particularly those in deprived communities. In conclusion, Dr Ramsay advocated that there is a need to encourage more effective risk management of water sources to control potential hazards. Additionally it is necessary to improve public understanding of the health risks associated with low level contamination of the water supply.

The final speaker of the day was Dr Virginia Murray, Director of the Chemical Incident Response Unit at Guy's and St Thomas's Hospital Trust in London. She looked at whether contaminated land posed a risk to the health of the population. As well as a description of current contaminated land policy a number of examples of recent incidents reported to the Chemical Incident Response Service (CIRS) were given. These provided case material reflecting the different incident scenarios, acute and chronic, along with some of the lessons learnt in their investigation. The incidents described were on old industrial sites and from industrial spillage, landfill and waste disposal sites and munitions, shells and bombs dumps. Effective understanding and management of public concerns will be required. To assist in this CIRS is developing a checklist for investigations of contaminated land by health authorities and local authorities. *(Alistair Brown)*

Future Events

1-12 NOVEMBER - Sustainability 2000

Free online global convention and learning zone for sustainable development. The website includes an online convention hall, discussion aireas, a research centre, multimedia games park, global search facility and a centre of excellence.

Venue: www.sustainability2000.org

Details: Delyth Forsdyke, Institute of Chemical Engineers. Email: dforsdyke@icheme.org.uk

29-30 NOVEMBER - UK and EU Legislation and its Impact on Industy and Local Authorities

Fifth international conference bringing together leading figures from both the regulatory authorities and industry top discuss the current legislative and technical developments being made to improve air quality.

Venue: The Scientific Societies Lecture Theatre, London.

Details: Penny Richards, IBC Global Conferences, Fax: 0171 636 6858; Email: cust.serv@ibcuk.co.uk

6 DECEMBER - Greenhouse Gas Reporting

Why greenhouse gas emissions are important; what are the general issues to consider; specific issues that can affect companies. This will be followed by a one day workshop on the practical use of the DETR greeenhouse gas reporting guidelines on 7 December at the Kensington Park Thistle Hotel.

Venue: Posthouse Kensington Hotel, London.

Details: As above.

6 DECEMBER - Environmental Law in the 21st Century

One day conference on the latest developments in environmental law.

Venue: The Hatton, 51-53 Hatton Garden, London EC1.

Details: Gerard Hunter, Hawksmere, Tel: 0207 881 1850; Email: gerard@hawksmere.co.uk

NSCA SCOTLAND

Thursday, 25 November

Quality Hotel Central, Glasgow

Seminar - Light Pollution

Tuesday 15 February 2000

Moat House Hotel, Glasgow

Annual General Meeting and

Seminar - Electromagnetic Fields & Telephone Masts

For further details contact Clare Carruthers, NSCA Scotland
Tel: 0141 287 6530; Fax: 0141 287 6592
Email: clare.carruthers@ps.glasgow.gov.uk

FORTHCOMING NSCA EVENTS

Wednesday 10 November
Training Seminar - NEC Birmingham
Air Quality Management Update

Thursday 25 November
Workshop - London
UK Dispersion Model Users Group

Tuesday 15 February 2000
Training Seminar - NEC Birmingham

Thursday 6 and Friday 7 April 2000
Spring Workshop
Staverton Park, Daventry, Northamptonshire

Tuesday 13 June 2000
Training Seminar - NEC Birmingham

Tuesday 12 September 2000
Noise Update 2000
Training Seminar - NEC Birmingham

Monday 23 to Thursday 26 October
Annual Conference and Exhibition - Scarborough
Environmental Protection 2000

For further details please contact
National Society for Clean Air and Environmental Protection
136 North Street - Brighton BN1 1RG
Tel: 01273 326313 EMail: KLennon@nsca.org.uk Fax: 01273 735802

nsca

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- Environmental Priorities for a New Millennium

Special NSCA Centenary Conference
13th IUAPPA Regional Conference

Monday 25 to Thursday 28 October 1999
Brighton Conference Centre

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Regional Air Pollution Issues
Environment and the Countryside
Managing Air Quality: Taking Stock of Progress
Building Sustainable Communities
Managing the Local Environment
Industry, Energy and the Local Environment
plus four Parallel Technical Sessions

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NSCA members Full Registration - £295 + VAT
Non-members Full Registration - £385.00 + VAT

Environmental Protection Exhibition 1999
Please contact Howard Phillips at Turret RAI, tel: 01895 454546 for detailed information

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